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ON

THE OPERATIVE SURGERY

OF

MALIGNANT DISEASE

BY

HENRY T. BUTLIN, F.R.C.S., D.C.L.

SURGEON TO ST. BARTHOLOMEW'S HOSPITAL; LATE ERASMUS WILSON PROFESSOR OF PATHOLOGY AND HUNTERIAN PROFESSOR OF SURGERY AND PATHOLOGY TO THE ROYAL COLLEGE OF SURGEONS

WITH THE CO-OPERATION OF

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W. BRUCE CLARKE (The Kidney)
ALBAN DORAN (The Ovary and Uterus)
PERCY FURNIVALL (The Stomach, Intestine, and Rectum)
WALTER JESSOP (The Eye)
H. J. WARING (The Liver and Gall-bladder)

SECOND EDITION

LONDON
J. & A. CHURCHILL
7 GREAT MARLBOROUGH STREET
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TO THE MEMORY OF

SIR JAMES PAGET, BART.

F.R.S., D.C.L., LL.D.

This Volume is Dedicated

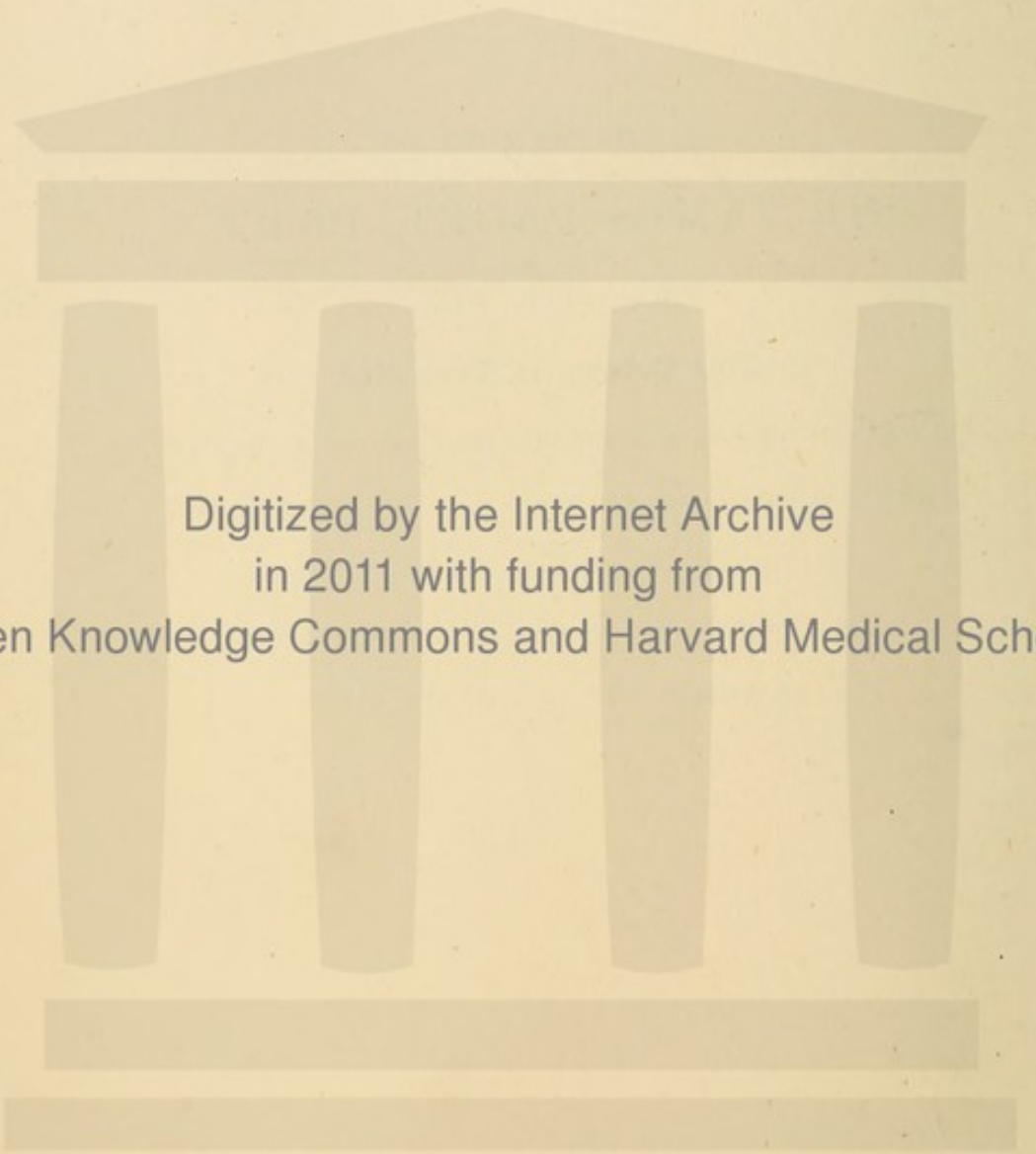
IN GRATITUDE FOR HIS INSTRUCTION WHILE A STUDENT,

FOR MANY ACTS OF KINDNESS AND ENCOURAGEMENT

SINCE THE PERIOD OF STUDENT LIFE,

AND, CHIEFLY, FOR HIS ILLUSTRIOUS EXAMPLE

IN PUBLIC AND IN PRIVATE LIFE



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PREFACE TO SECOND EDITION.

TWELVE years ago the first edition of this book was issued. Two years ago the second edition ought to have been prepared, but I found it impossible at that time to undertake it; nor could I think of any one of sufficient experience of malignant disease who would be willing to charge himself with so tedious and thankless a task. The changes which have taken place in surgery since 1887 have been very great, and the relation of surgery to malignant disease has undergone very important modifications. In consequence, some of the chapters of this book have needed to be rewritten, and there is scarcely one of them which has not required considerable alteration. In order to render it more worthy of the position which I wish it to occupy as a faithful reflection of the relation of surgery to cancer at the present moment, I have prevailed on the following surgeons to be responsible for the chapters on cancer of those parts of the body which they are more familiar with than I am:—Mr. James Berry, Mr. Bruce Clarke, Mr. Doran, Mr. Furnivall, Mr. Walter Jessop, and Mr. Waring. To all these gentlemen I tender my hearty thanks for their co-operation. In addition, I am very much indebted to Mr. Henshaw, who has collected and examined for me most of the literature of the last twelve years, and who has prepared the index.

I am convinced that, so long as malignant disease is treated by operation, there ought to be such a book as this. It is intended to:

Indicate the class of cases and the parts of the body which may be treated by operative means with the best prospect of success.

Encourage the performance of operations in suitable cases at the earliest period.

Discourage the repetition of useless operations.

Indicate the extent of removal which is required for the treatment of the different varieties of cancer in different parts of the body.

82 HARLEY STREET, W.

March 1900.

PREFACE TO FIRST EDITION.

At the end of two years, during which all my leisure has been devoted to this work, I venture to issue it to the Profession, not because it is complete, but because it is as complete as my means of information and knowledge have permitted me to make it in the time which has been given to it. And if I am asked why I did not vote a longer time to the collection of material, and thus render some of the chapters far more complete than they are at present, my answer must be that a book of this particular character should not occupy too long in the making, lest some parts of it should fall behind the times and be old when the book is yet new. At the best, it can only offer a faithful reflection of the relation of surgery to cancer at the moment at which it is written, and I cannot hope that it will occupy a lasting place in the literature of the subject.

But I do hope that it may attain one or other, or all, of the following ends:—

Indicate the class of cases and the parts of the body which may be treated by operative means with the best prospect of success.

Encourage the performance of operations in suitable cases at the earliest possible period.

Discourage the repetition of useless and dangerous operations.

Raise the question of the propriety of the removal of entire organs for the cure of cancers of limited extent.

And with this hope I part from it.

82 HARLEY STREET, W.
August 1887.

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THE

OPERATIVE SURGERY

OF MALIGNANT DISEASE

CHAPTER I

INTRODUCTION

THE following pages are intended to give as clear and precise an account as possible of the present relations of operative surgery to malignant disease. Such an account involves a great deal of tedious labour, and is often very disappointing on account of the imperfect information which is at hand of the later results of operative surgery. In spite of this, I feel that such a review is necessary, and that it ought to be undertaken and renewed from time to time. First, because I am sure that the good results of operations for malignant disease have been greatly underrated in many quarters; secondly, because I feel equally sure that there is in other quarters still a tendency to carry operative surgery to an unjustifiable length. It is therefore of the highest importance that we should be in possession of as complete information as we can obtain of the results of operations for malignant disease, and that we should make some attempt to formulate our practice in accordance with this information. The reasons which first led me personally to undertake so large and difficult a task were the great interest which I have for very many years taken in the subject of malignant disease, the material which was in my possession, and the knowledge of the sources from which much more material might be derived. A sense of duty has led me to repeat the task, for some of the statements made in the first

edition need to be largely modified. And some of them are almost wholly wrong. For some reasons I should like to have reprinted the former introduction, and to have written a separate introduction to this edition in order that the two might be compared. This would, however, render the introduction very long, so that few would care to read it. I have, therefore, been content to indicate the subjects on which my opinions have undergone a change and the reasons for the change.

Continuous heavy work in hospital and private practice would have effectually prevented me from ever completing this edition had I not been able to persuade some of my friends and colleagues to undertake the chapters for which they are peculiarly competent. Also a large part of the work of searching out references was admirably performed for me by Mr. Henshaw of St. Bartholomew's Hospital. With this assistance I have at length succeeded in bringing my labour to a conclusion. It has been in some important respects much more satisfactory this time than it was a dozen years ago. There is much more completed material from which to draw up conclusions on the later results of operations. Patients have been followed up both in this country and on the Continent with a care which has never previously been applied. And this continued observation has proved—what I always contended it would do—that the more closely the patients are followed up, so much the better are the final results.

A return at the end of more than ten years to a prolonged study of the subject has impressed several matters very strongly on my mind.

First, the reduction of the immediate mortality of almost all operations is very striking.—I need hardly say that this is due to aseptic and antiseptic surgery, and to the much greater care which has been devoted to carrying out the details of whichever method has been adopted. The improvement is manifest in almost every chapter, but it is particularly evident in the results of amputation, which can best be studied in the chapter on "The Bones" (chapter iii.). On the other hand, the mortality of the operations for malignant disease of some parts of the body is not much less than it was a dozen years ago. Removal of the upper jaw, for example, still furnishes a very high rate of mortality. This is due, not only to the difficulty

of ensuring asepsis or antisepsis, as the case may be, but to the fact that a recognition of the exceeding liability to local recurrence of malignant disease of the upper jaw has led to the performance of much larger local operations.

Secondly, the extreme importance of a close study of the minute anatomy and pathology of each kind of malignant disease in each separate part of the body in which it occurs.—I first drew attention to the vast difference which exists in the degree and kind of malignancy of malignant tumours according to their seat of origin in the year 1883 ("Malignant Disease of the Larynx").* In the first edition of this book I directed renewed attention to this point, considering it "essential that the malignant diseases of each tissue and organ should be considered separately." I would now again emphasise the importance of this study, and would cite as examples of the use of it the following: the influence of researches into the minute anatomy and pathology of cancer of the breast on the character and extent of operations performed for the removal of the disease, and the much greater success which has been attained; the large influence which a recognition of the essential difference between the intrinsic and extrinsic cancers of the larynx has produced on the operative surgery of malignant disease of the larynx, and of the much greater success which has been achieved in consequence. Up to the present time experimental pathology has done little or nothing to elucidate the difficult problems associated with malignant disease. But accurate observation has done much, and will, I feel sure, do much more in the immediate future. It is the only true foundation on which a rational system of operative surgery can be applied to the treatment of malignant disease. Within this general law there is another which must not be lost sight of in actual practice. Not only is there a vast difference in the possible course and effects of similar varieties of malignant disease in different parts of the body, but there is often a remarkable difference in the course of tumours of similar structure arising in the same part of the body, and apparently in precisely similar conditions. I believe that this refers more to the comparative

* "But I am not aware that any author has ascribed to the mother tissue a greater influence than this, or that any one has suggested *that the mother tissue largely influences the degree and kind of malignancy presented by a tumour*."—Page 4.

rate with which the disease runs its course than to any other property. It is a matter of common knowledge that there are occasional cases of very slow-running carcinomas of the breast where the tumour has only reached a very small size at the end of many years, and where very many years elapse before the lymphatic glands are affected or the disease is disseminated. Yet these events occur, given the necessary time and stimulus. Again, while epithelioma of the lower lip is a notoriously mild malignant disease, there occur from time to time cases which present an extraordinary malignancy. I have mentioned such a case in the chapter on the "Lower Lip." The difference may be likened to that which follows the taking of a dose of poison. The same poison produces the same or similar effects in different people and runs a similar course; but the course and the effects are determined by the dose of the poison and the resistance of the individual. All this has to be taken into account in judging of the fitness of the individual case for operation, and of the prognosis of the disease or of the operation. It may be accepted as a general rule to which there are few exceptions that the slow-growing cancers are the most favourable for a radical operation, and that the quick-growing cancers are the least likely to be successfully removed.

Thirdly, the immense value of early diagnosis.—I cannot yet tell how much, but I believe that a very large part of the success of the future of the operative surgery of malignant disease will depend on early diagnosis. The advantage which has already been derived from successful attention to the diagnosis of malignant disease is illustrated in the Larynx (chapter xvi.), where the early diagnosis of intrinsic disease has been followed by early operation, with an astonishing success. Mr. Jessop attributes the improvement in the results of operations on the eye to earlier diagnosis of the gravity of the disease. On the other hand, the extreme difficulty in making the diagnosis at a sufficiently early period of the disease has practically hitherto excluded the possibility of successful operation on some parts of the body. Mr. Berry's chapter on the Thyroid illustrates this. The diagnosis of malignant disease of the thyroid is very rarely made until the tumour has broken through the capsule of the gland, and when it has done so it is too late to operate with any reasonable prospect of success. Almost every chapter contains

allusions to the necessity of early diagnosis, and many of the chapters contain suggestions for the making of an early diagnosis; for it is now much more generally recognised that the earlier a radical operation for cancer is performed, so much the more likely is the operation to be permanently successful. Early operation can only follow early diagnosis. Hence the supreme necessity for a continued and active study of the diagnosis of malignant disease in every part of the body; and not only of actually existing malignant disease, but of the conditions which precede the occurrence of malignant disease—predisposing conditions and pre-cancerous stages. For example, the various conditions of chronic superficial inflammation of the mucous membrane of the mouth, especially of the tongue. It has long been known that all these conditions predispose to the occurrence of squamous-celled carcinoma, and it was thought that the actual cancer might commence with almost equal frequency in one or other of several different forms, in the form of an ulcer, a fissure, a wart, or a lump. Examination of a large number of cases has led me to the opinion that the very large majority of cancers of the tongue commence in the form of a compound wart or warty growth, rarely in the form of an ulcer, or fissure, or lump. I believe that predisposing and pre-cancerous conditions will be found to be much more common than they are now thought to be. Sir James Paget discovered and defined one for the breast in a certain condition of the nipple and areola; and within the last two years I have found that the mucous membrane of the vulva is liable to leucoma, like the mucous membrane of the mouth, and that the condition is probably a strong predisposing cause of epithelioma, for in the only three cases which I have seen the patient either was, or had been, suffering from that variety of cancer. How much hope for the future may lie in the recognition of these various predisposing conditions, the treatment of them, the instant recognition of the pre-cancerous stage, and the prompt removal of it!

Unhappily, imperfection of diagnosis is not the only obstacle to early operation. There is the ignorance of the patient, and the unwillingness to undergo an operation at an early period of the disease. Preconceived ideas of the painfulness of cancer prevent the patient from even suspecting

that an indolent and painless little lump can be the beginning of an attack of cancer. No wonder, then, if the proposal of an operation is deferred until that fatal period when there is no longer the least doubt of the nature of the disease. Again, there are many cases in which cancer is discovered quite by chance. I used to think that women who came to the hospital with tumours of the breast of quite large size, which they declared that they had only just discovered, were either very unobservant or had deliberately concealed the existence of the tumour lest they should be persuaded into an operation. When first more highly educated and intelligent women came to me with similar lumps, and with a similar story, I fully believed that they had purposely concealed the existence of the disease. But the frequent repetition of the same story under precisely similar circumstances has made me sensible that the account is true, and that the discovery of the disease, particularly in the breast, is, far more frequently than not, accidental. I am the more convinced of this because I have on several occasions of late years been appealed to at the earliest possible moment after the discovery of such a tumour by ladies who have suspected the dangerous character of the lump, and have been urgent for immediate operation. Perhaps worse than any of these is the obstacle in the attitude of a large number of medical men towards operations for the cure of cancer. They have seen so many unsuccessful operations performed for cancer in all parts of the body that many of them are sceptical of the possibility of cure by an operation. They advise operation, it is true, in many instances in which they have no hope that it will prove to be successful; but they do so solely in the hope of alleviating the distress of their patients, and often defer doing so until all hope of permanent success is past. On the subject of the cure of cancer a very large number of members of our profession are fatalists. They look on their patients with cancer as doomed. It is scarcely to be wondered at that men in general practice should take a gloomy view of the results of operations for cancer, for it falls to their lot to see the recurrence of the disease or the outbreak of it in some other part of the body, and they have to bear the distress of attending the patients through to the bitter end.

I can better understand their attitude than that of the

operating surgeons who take a similar gloomy view. I do not know when I have been so disagreeably affected as I was during the debate on Mr. Sheild's paper at the Royal Medical and Chirurgical Society (Transactions, vol. lxxxi. p. 193, 1898). The opinion expressed by a number of leading surgeons was that operation for cancer of the breast is but palliative, at the best. Once cancer, always cancer! If, after the operation, a woman does not die of cancer of the breast, she will certainly do so of cancer of some other part of the body.

This kind of high calvinism in regard to cancer is exceedingly unfortunate, for it leads to the deferring of operations which ought to have been performed far earlier; it leads to hopelessness on the part of the patient; it leads to the performance of insufficient operations; and it is very difficult to combat successfully. If a patient lives ten or fifteen years without recurrence, the case was not one of cancer. If a patient dies of some other disease eight or ten years after a successful operation for cancer, there is no doubt the disease would have recurred had the individual lived longer. As to the three-years' limit, it is far too short, as the cases collected by Sheild have plainly shown.

To the first of these objections we are now able to reply with accurate accounts of the general and microscopical character of the disease. To the second, there is really no reply: it is a woman's argument. The third must be dealt with more at length.

The three-years' limit is a purely arbitrary period of probation. If a patient is well at the end of three years after the last operation for malignant disease, and there is no sign of recurrence or of dissemination of the disease, that patient is spoken of as *cured* by the operation. I think the limit was first suggested by Volkmann. It is very generally adopted in estimating the final results of operations for cancer. It is founded on a sufficiently wide experience. For example, take the figures quoted by Gross from Von Winiwarter. In 203 cases of recurrence of cancer after operation in different parts of the body, the disease recurred in 180 before the end of the first year, in fifteen between the end of the first and second years, in six between the end of the second and third years, only in two after the end of the third year was past, and only in one per cent. after the end of the third year from the

operation. This small percentage of deferred recurrences need not, therefore, affect the general application of the law. It would, of course, be very much more philosophical to apply a special period of probation for each particular variety of malignant disease in each several part of the body. It may at some future time be possible to do this. But we are scarcely in a position to do it with any approach to accuracy at the present moment, and an unsuccessful attempt would lead to a great deal of confusion. If such special periods were applied, the effect would certainly be to shorten the time limit for the malignant diseases of many parts of the body. For malignant disease of the tongue, the tonsil, and the parotid gland, for example, the three-years' limit is much too long. For the breast, it is sufficiently correct. For the lower lip and face, it is too short. In the end the figures might work out very much as they do at present, although I should be surprised if they were not to the advantage of those who believe in the cure of the disease by operation. Certainly the three-years' period of probation is not in favour of the "cured" cases, and does not make the results appear more flourishing than they really are.

In the calculation of percentages the calculation has been made on one uniform basis. The percentages of deaths due to the operation have been estimated on the total number of patients who were treated by operation, and of whom there are records to show whether they recovered or died. The percentages of "cures" have been estimated on the number of patients who were alive and free from disease, or who died of some other malady (not cancerous), more than three years after the last operation, compared with the total number of patients who were treated by operation, and of whose end or condition at the termination of that period there are records. The fatal operation cases are therefore included in the totals. This course has not been adopted in all the statistical reports which have been published on these subjects. In some of them the percentage of cures has been estimated only on the total number of patients who recovered from the operation. There are, of course, reasons for the adoption of this method of reckoning, but I think there are still stronger reasons against it. If the question were asked by one of the laity, or even by members of our profession, how far an operation for

the removal of malignant disease of a certain part of the body was likely to be permanently successful, and the reply was made that fifteen per cent. of the patients remained permanently free from the disease (on the three-years' limit), the questioner would be very much surprised, and probably greatly disgusted, to find at a later period that the calculation had been based only on the total number of persons who recovered from the operation and who had been kept under observation, and that the mortality due to the operation itself amounted to no less than twenty to thirty per cent. In some of the statistics, on the other hand, an injustice of an opposite character has been done. The percentage of successful cases has been calculated on the total number of patients operated on, whether they have been kept under observation or not. This method of reckoning has, I presume, been employed on the assumption that all the patients who have been lost sight of after recovery from operation were unsuccessfully treated. This opinion has been expressed by more than one surgeon, and has induced operators to take a more gloomy view of the permanent results of their operations than they should do. It is obvious, on consideration, that the only fair way of dealing with these patients is to leave them wholly out of the reckoning in estimating the percentages of successful cases. That some of them die within a longer or shorter period of recurrence or affection of the lymphatic glands or other parts of the body there is no doubt. But there is just as little doubt that some of them survive and would be reckoned amongst the cured cases. I have had considerable experience in searching out the results of past operations for malignant disease, and certainly do not agree with Mr. Barker in his remark: "Others, of course, may have recovered and been lost sight of, but it is always usual for the successful cases to come to the surface." (Holmes's "System," ii. 605, third edition.) Many of the most successful cases which I reported in "Sarcoma and Carcinoma" some years ago would never have come to the surface had I not sought them out, often with great difficulty after numerous failures. Things have not altered much in this respect since the time when, more than 1800 years ago, only one of the ten healed lepers returned to give thanks to the Healer. Hospital patients return to the hospitals when they are forced to do so by a return of their disease or by some other malady,

but it is not in the nature of things that people belonging to the lower orders, to whom the day is so valuable, should come or send after long intervals to let the doctor know how successful he has been.*

In the introduction to the first edition I attacked certain routine operations which I did not believe to be justified at that time, either by the results claimed for them, or by the pathology of the disease. One of these was *the removal of entire organs for cancers of small extent limited to a segment of the organ;* the other, *the removal of the neighbouring lymphatic glands as a necessary accompaniment to the removal of the primary tumour*, even when they cannot be discerned to be enlarged by the closest scrutiny at the time of the operation. These questions will be referred to in several of the chapters, so that only the main principles on which they rest will be dealt with here. My opinions on both these questions, as applied to several parts of the body, have been largely modified during the past ten years, chiefly by the progress which has been made in our knowledge of the morbid anatomy of malignant disease. Of course there are certain parts of the body, as the eye and testis, which are almost invariably completely removed, if they are attacked by malignant disease. There are other parts of the body, such as the tongue, in which the custom has been to limit the operation to a part of the organ. And there are other parts again, such as the breast, in which it has been for many years the routine custom to remove the entire organ, on very little other ground than a kind of suspicion that a breast which is capable of growing a cancer is necessarily a degenerate organ, already prepared for the occurrence of cancer, and likely to produce the same disease in any part which has been left behind. I attacked this routine treatment and took the breast as an example, because it did not seem to me to be justified by our anatomical knowledge of the extent and course of the disease, and because I believed that such "set operations" were much less likely to be

* To those who intend to look up a series of old cases of operation, and who have had no experience of the method of doing so, I would venture to recommend the perusal of pages 52 and 53 of volume xxxiv. (1898) of the *St. Bartholomew's Hospital Reports*, where I have given a detailed account of the method as applied to hospital and private patients. The inquiry is very costly in time, and sometimes in money; but it is well worth all that is expended on it.

successful than the less regular operations which were directed to the disease as a centre, and to the removal of a wide area of the surrounding healthy tissues. A perusal of the results of my own operations for cancer of the breast in the *St. Bartholomew's Hospital Reports* (vol. xxxiv. 1898) will show that these views were thoroughly justified. But they led to an opinion which has been more than once publicly stated, that I was in favour of "partial operations" for cancer. I thought I had taken care, both in the introduction and in the several chapters in which this question was discussed, to protect myself against this imputation. The feeling which predominates throughout the first edition of this book is a feeling in favour of the freest removal of cancer, and at the earliest possible period. The objection to the routine removal of entire organs, such as the breast, was that the operator was "so intent on the complete removal of *the organ*, that the free removal of *the tumour* becomes a secondary consideration," and that I had frequently seen the narrowest area of apparently healthy tissue removed on one side of a tumour while several inches of healthy tissues were removed on the other side.

Since that time very good reasons have been adduced for the complete removal of the breast in every case of cancer in which the operation can be borne, and for the large routine operation which I have described and recommended in the chapter on the Breast. It is not improbable that we shall be directed by similar researches to remove the entire organ in cases of malignant disease of other parts of the body, and so long as this is done in obedience to anatomical knowledge nothing can be better. To decline to modify our routine practice in accordance with confirmed advances in the knowledge of the anatomy and pathology of malignant disease would be worse than weak: it would be wicked. On the other hand, it is already quite evident that the description of the anatomy and pathology of malignant disease in one part will not apply to the anatomy and pathology of the same variety of disease in every other part of the body. Every part requires to be studied individually and for itself. There are some malignant diseases which do not for a moment call for the removal of the entire part or organ in which they grow; for instance, the central sarcomas of the long bones. There are others for which it might theoretically be desirable to

remove the entire part, but in which the advantages to be gained by the operation are too small to justify so grave a mutilation.

On the necessity of the dissection of the neighbouring lymphatic glands as an accompaniment of the removal of the primary disease in certain parts of the body, I have formed the opinion that it would be an admirable practice, if it could be carried out successfully. I formerly opposed the routine operation for two reasons: the increased danger to life from the operation itself; and the strong probability of leaving behind some of the glands when they are so small that there is no obvious disease. Where these objections can be met, I have no doubt of the desirability of removing the glands, not only in cases in which they are already badly or slightly affected, but in cases in which there is reason to believe that they will be affected. In fact, the operation is most desirable as *a precautionary measure*. Both objections have been met so far as the removal of the axillary glands is concerned. The mortality of the largest breast-operations has been reduced to a very small percentage, and the modern method of clearing out the contents of the axilla renders it very improbable that any glands, however small, will be left behind. In other parts of the body the conditions are not so satisfactory. There is much greater doubt of the particular group of glands likely to be affected in a given case of cancer. There is uncertainty as to whether it is necessary to remove the lymphatics between the primary disease and the glands; and there is not the same ease in clearing out all the tissues which are likely to contain glands. For the complete removal of the glands likely to be affected by primary malignant disease of the mouth, tongue, lip, &c., I have devised an operation for clearing out the contents of the anterior triangle of the neck. It is hardly so perfect as the operation for the removal of the contents of the axilla, but it is far better than the mere removal of a few enlarged glands which is generally practised. Unfortunately, many of the cases are complicated by the possibility of affection of the glands on both sides of the neck. Continued research and close observation will probably enable us to effect much better results in the future.

In the first edition I spoke as I felt, very strongly, against the repetition of operations on certain parts of the body which

were attended by a very high rate of mortality and a very small permanent success. The records of some of these operations were positively ghastly. Three hundred and sixty-four operations for malignant disease of the larynx (complete excisions), œsophagus, kidney, uterus (through the abdominal incision), thyroid and pylorus, with 238 deaths and 126 recoveries. And of the 126 persons who recovered from the operation there was only one who was known to be alive and free from recurrence of the disease more than three years after the operation. And these results were the work, not of amateurs, but for the most part of distinguished surgeons. They were generally spoken of as the results of pioneer work in surgery, and it was hoped that the same operations would shortly be practised with a small mortality and decided success. I could not see that this was probable, as the only hope of real improvement appeared to lie in early diagnosis, and I scarcely believed that to be possible for the malignant diseases of some of these parts. Some of the operations have never gained a footing in this country, where there has always been an aversion to a high rate of mortality from operations which are not likely to prove successful, even if the patient recovers from the operation. Complete extirpation of the larynx has very seldom been performed, and then usually by surgeons who have had little or no special experience in diseases of the throat. Œsophagectomy has, so far as I know, never been practised in Great Britain. Cancerous thyroids have very rarely been attacked, while pylorectomy for cancer has never held its own against operations for relief, such as gastro-enterostomy. On the Continent complete laryngectomy has been gradually losing ground, and operations for cancer of the larynx have been restricted more and more to removal of the disease by thyrotomy and to partial removal of the larynx. Œsophagectomy has only been performed on very few occasions. Cancer of the thyroid is very seldom treated by operation. On the other hand, improvement in the diagnosis of diseases of the kidney and the pylorus, and surer methods of dealing with them by operation, have rendered it possible that a certain success may be attained in the surgical treatment of the cancers of both organs. The hopelessness of operations for advanced disease of these internal organs is becoming generally recognised, and is expressed in the relative frequency with which some of the

best Continental operators now perform radical and palliative operations (on the stomach, for example).

On the other hand, there is still a great tendency on the part of some surgeons of the advanced school to operate for malignant disease as long as there is life in the patient. The severity of some of these operations and the miserable condition in which the patient has been left by them are related in the following pages. It is difficult to tell which to admire the more—the boldness and skill of the surgeon, or the extraordinary endurance of the patient; and it is equally difficult to understand that either the patient or the surgeon could think life worth living under the conditions of recovery. Large, even very large, operations for malignant disease are frequently justifiable, even when they offer little or no hope of permanent relief, provided they are very likely indeed to afford very considerable relief during the time the patient lives. For example, amputation at the hip-joint for sub-periosteal sarcoma offers really no prospect of cure; but it is not only justifiable, but urgently called for in order to relieve the patient of the terrible incubus of an enormous tumour, which may ulcerate and occasion the most cruel suffering up to the hour of death. The danger of the operation need scarcely be taken into consideration provided the patient who recovers is certain to be relieved. But what is to be said of a huge operation which is followed speedily by recurrence of the disease in the mouth and pharynx, and which renders it necessary for the patient to breathe through a tracheotomy tube, to feed through an œsophageal tube, and to speak through an artificial larynx? And what can be thought of the success of an operation which leaves the urine constantly dribbling away from an opening in the wall of the abdomen? The saving of life at such an expense seems only justifiable under very rare conditions.

The more I see of the operative surgery of malignant disease, the more I become impressed with the truth of certain propositions which I laid down years ago: (*a*) that the larger and more dangerous to life an operation, so much the less likely is it to be permanently successful; (*b*) that the earlier a cancer is removed, so much the more likely is the operation to be permanently successful. The second may seem a self-evident proposition, but it is astonishing how often it seems to be overlooked even by able practitioners in all parts of the country. A

study of the following pages will show that the first proposition, though not so true as the second, is still very near the truth and that the exceptions to it are very few. Early and moderate operations mean early diagnosis, and I am more than ever convinced that the success of the operative surgery of malignant disease in the future is very largely a question of early diagnosis.

Early diagnosis alone, however, will not suffice to ensure early operation, unless the unwillingness of the patient and the hopelessness of the doctor can also be overcome.

In this book I have done my best towards this end, by placing before the profession a record of considerable improvement in the operative surgery of malignant disease in almost all parts of the body: fewer deaths and more cures.

Those who object to the term "cure" of the disease, and who are loth to believe in the possibility of cure, may still be comforted by the consideration of the large number of persons who suffer from cancers, which, from their position or their extent, are not amenable to operation; and of the percentage of deaths from recurrence and dissemination of the disease which is, for almost every part of the body, still much larger than the percentage of successes.

Before I bring this introduction to a close, I would draw attention to a class of tumours to which very little attention was paid twelve years ago, but which will have to be seriously reckoned with in the future—the endotheliomas. They are particularly referred to in the chapters on the Parotid Gland and Palate. The group is of importance for two reasons. In the first place, owing to their peculiar structure, they have been mistaken both for sarcoma and carcinoma, even when they were perfectly innocent tumours, and consequently the malignant tumours of those parts which are liable to endothelioma have acquired a reputation for comparative benignity which they had no claim to. In the second place, there are undoubtedly malignant as well as innocent endotheliomas, and the microscopic distinction between them is not yet clearly defined. On this account the study of the malignant tumours of certain parts of the body has been thrown for the moment into some confusion. Fortunately, there is every reason to hope that the discovery of the true nature and origin of these endotheliomatous tumours will result in simplifiying the subject of malignant disease in the future.

CHAPTER II

MUSCLES

SINCE the period at which Teevan wrote an article "On Tumours in Voluntary Muscles" in 1863 (*British and Foreign Med.-Chir. Review*, xxxii. 504), very few cases of primary malignant disease of the voluntary muscles have been published. Indeed, I have only been able to gather together from many sources rather more than twenty cases for which an operation was performed. Few as is the number of cases, they afford, however, very important information on the subject. In the first place, in spite of the many different names which have been attached to the tumours, there is reason to believe that the voluntary muscles are rarely, if ever, primarily attacked by any other disease than sarcoma. The tumours which I have myself examined have been round- or spindle- or oval- or mixed-celled sarcomas; and I am not aware of any trustworthy examination of the so-called cancers, or scirrhus, or encephaloid tumours from which one could judge whether they were really what they were thought to be.

The muscles which were affected in the upper extremity were the deltoid and pectoralis major, the biceps and triceps, and the brachialis anticus; in the lower extremity, the glutæus maximus, the sartorius and adductors, the rectus, the gastrocnemius and soleus, and the peroneus longus; but the pectoralis major, the biceps, and sartorius, were more often affected than any of the other muscles. The patients were male and female, and varied in age from twelve to seventy years. The disease was much more common in adults than in children. Some of the tumours grew very slowly, but their speed of growth differed largely in different patients, and at different periods of the history of the case, becoming much more rapid in several of them shortly before the operation was performed. They varied also greatly in shape and size. Some of them occupied

the interior of the sheath, destroying or involving the structure of the muscle, and replacing it by a growth nearly resembling it in shape, but of much larger size. Others of them presented a globular or oval shape, and their size varied from that of an egg to that of the head of an adult man. In those instances in which the disease was left to itself, the tumour grew through the sheath of the muscle, infiltrated the adjacent muscles or other of the soft structures, became adherent to the integument, and in time ulcerated. I have only found one instance in which there was glandular affection associated with the primary tumour—a case in which the disease was of the triceps muscle, and a lymphatic gland was matted to the ulnar and musculo-spiral nerves ; but what relation this gland bore to the disease, or whether it was involved in the continuous growth of the tumour, there is no evidence to show. In nearly every instance, no matter what was the situation or extent of the primary disease, a special note stated that the lymphatic glands were not affected. In two instances enlargement of glands was noted with recurrence of the primary disease ; one of these was the case which has just been mentioned ; the other was a case of primary tumour of the biceps muscle, in which, when the disease recurred after removal, the cervical glands were noticed to be enlarged. In one or two instances there were two tumours, separated by a larger or smaller interval, but in the large majority of cases the primary disease was single. As a set-off against these negative qualities of primary malignant disease of the muscles, there was exhibited one positive quality of the greatest importance so far as their treatment is concerned—their great tendency to recur *in situ*. Recurrence took place in nearly every instance in which the patient recovered from the operation, and was kept under observation afterwards. Of the occurrence of secondary disease of the organs or distant tissues I can say little, for the cases which I have collected afford very little information on the question. In one instance (of an oval-celled sarcoma of the adductor muscles of a year's duration) there were three nodules in the lung when the patient died the day following amputation at the hip-joint, and two other patients died with symptoms of affection of the chest ; but in other instances of much longer standing no secondary disease was discovered at the autopsy, even when the disease appeared to have run its natural course.

Methods of Treatment.—I am not aware that any one has followed out the suggestion of Teevan to remove the entire muscle from end to end in the surgical treatment of malignant disease, nor do I think that the least advantage would be gained by such a step. On the other hand, it is quite clear, from a perusal of the histories of cases, that the incisions should be carried very wide of the tumour on account of the great tendency of the primary sarcomas of the voluntary muscles to recur. Only two operations were practised in the cases I have seen and collected—excision of the tumour, and amputation of the limb. In some of them the tumour shelled out easily, in others a difficult and dangerous dissection was required before it could be removed, and a portion of the muscle in which it lay was cut away above and below. Amputation was performed in cases in which the tumour was of large size and reached close up to the joint at or near to which the amputation was performed. It was also performed for the removal of recurrent disease.

No description is needed of such operations; indeed, no two of them (the excisions) were alike. They varied according to the situation and extent of the tumour, and the dressings differed according to the period at which they were performed and the usual practice of the operator.

Results of Operations.—Of the twenty-two patients who submitted to operation, three died of the direct effects of the removal of the disease. In these three cases the tumour was of very large size, situated in the adductors, the soleus, and the pectoralis major. In the first, amputation at the hip-joint was performed, and the patient died of shock at the end of twenty hours. Had his life been spared, it could not have been for long, for there were already several nodules in one of the lungs. In the other two cases the tumour was simply removed by dissection: one of the patients died of hæmorrhage, the other of pyæmia. The percentage of deaths is very large, larger than ought to follow even such extensive and severe operations as the majority of those which were performed. The number of operations was, of course, far larger than the number of cases, for a second operation was performed in more than six of them, and several operations in one instance in which the disease had recurred four times when the last report was written. An idea may be obtained

of the severity of some of them by the recital of a case under the care of Volkmann, who cut away four inches of the femoral artery and vein during the removal of a recurrent tumour of the sartorius.

Of the nineteen patients who recovered from the operations, seven were lost sight of as soon as they left the care of the surgeon.

In nearly every one of the remaining twelve patients recurrence of the disease was noted. The reappearance of the tumour was immediate in two of them, and occurred within a few weeks in other cases. With two exceptions, in which the tumour began to grow again at the end of eighteen months and two years respectively, the recurrence took place always within six months of the removal of the primary disease. But it must be noted that the operation, in ten of the cases, was limited to the mere removal of the disease, with a greater or less quantity of the surrounding tissues. In the eleventh, the arm was amputated at the shoulder-joint, but the disease was already far advanced, and extended so far upwards that the line of the amputation did no more than just clear it; and in the twelfth, amputation of the thigh was performed for a round-celled sarcoma of the peroneus muscle.

Of cases cured I have not one to report, although I had hoped to have two. For Mr. Barling wrote me in November 1887, to tell me that the two patients he had reported in the Pathological Society's Transactions (xxxvi. 414) were quite well and free from all sign of recurrence of the disease. One of the patients was a woman, twenty-eight years old, with a tumour of slow growth of the leg. In January 1885 amputation was performed in the lower third of the thigh. The tumour proved to be a round-celled sarcoma of the peroneus longus. The other patient was a young woman, twenty years of age, with a growth of the arm, also of five years' duration. It was found to be an alveolar sarcoma of the lower half of the triceps, and had to be dissected off the humerus. A gland which was affected and adherent was removed at the same time. The operation was performed in February 1884. In January 1885 there was a recurrence, which was so grave that the arm was amputated at the shoulder-joint, and a gland which was found to be affected was taken out. Mr. Barling's letter showed that both these patients were well and free from

disease nearly three years after the only operation in one case, after the second operation in the other case. The result was peculiarly satisfactory, on account of the grave character of the recurrence in the second case. I have lately communicated with Mr. Barling, who has informed me that "both the patients have been dead several years, and both died with fluid in the chest." But Mr. Barling had not seen either of them in their last illness, and could not give the exact dates. There does not appear to have been recurrence of the disease *in situ* in either instance, but, unfortunately, there is reason to fear that death was due in both to affection of the lung or pleura. These cases offer the nearest approach to complete cure which I can offer, and it is important to bear in mind that both patients were treated by amputation of the limb.

I cannot but believe that the suggestion made in the last edition of this book is correct—namely, that amputation high above the disease is the only means which offers a reasonable prospect of permanent relief. Removal of the tumour, even when it has been contained in a perfect capsule, and has shelled easily out of its surroundings, has been followed invariably by recurrence of the disease.

CHAPTER III

THE BONES

In the consideration of this part of the subject, it is essential that the sub-periosteal tumours should be separated from those of central origin, and further to consider, as far as lies within our power, the results of treatment on the sarcomas of the different bones separately.

It will be well to regard all primary malignant tumours of bone as sarcomas, whether they exhibit an alveolar structure or not. Probably the modifications of their structure do not affect materially the course which they pursue. Two things, however, with regard to structure must be borne in mind: (1) the round-celled sarcomas are, speaking generally, more malignant than the spindle-celled or mixed-celled tumours. This accords with our experience of round-celled sarcomas in all parts of the body. The mixture of the proper elements of sarcoma with those of cartilage, bone, or fibrous tissue has, so far as I am aware, no influence on the course of the disease. (2) The giant-celled, or myeloid, sarcomas are much less malignant than the other varieties. The long bones of the lower extremity are much more liable to malignant disease than the long bones of the upper extremity: the femur and the tibia are the most frequently affected of all the long bones, the tibia perhaps rather more often than the femur, while the fibula is very rarely attacked. The humerus comes next to the tibia and femur in liability to the disease: the radius is not often attacked, and the ulna so seldom that it is difficult to collect any number of cases of ulnar sarcoma.

Sub-periosteal Sarcomas may affect most of the bones of the body, but they are very rare in the short and irregular bones. Those bones with which we have to deal are the bones of the thigh and leg, the arm and forearm, the clavicle and scapula, and the jaw-bones, but it will be more convenient to

take the jaw-bones in another chapter. I have said nothing of the skull and bones of the pelvis, for, so far as surgery is concerned, the sarcomas of those bones are not often within the reach of removal with any reasonable prospect of success. For the same reason I omit the sternum. The ribs ought not to be omitted, but primary sarcomas of the rib-bones are not so frequent that they need occupy our attention.

The lower end of the *Femur* is usually the seat of sub-periosteal sarcoma, of whatever variety, but the occurrence of the disease is not limited to the lower end. The tumour in most instances increases rapidly in size, but the rate of growth is subject to considerable variation. Young adults of both sexes, from fifteen to twenty-five years of age, are much more liable to the disease than persons at the extremes of age: males are more liable than females. The tumours frequently ossify and calcify and chondrify, and undergo cystic or cystoid degeneration. However large they may become, they rarely ulcerate. The lymphatic glands are not usually affected, although those tumours which are seated at the upper end of the bone may produce glandular affection if they attain a sufficiently large size to reach the nearest lymphatic glands, or, the glands may be affected as a part of the general dissemination of the disease. Secondary growths are common in the lungs, and they may occur in other organs, for there are many cases on record, especially of round-celled sarcomas, which have been associated with secondary tumours in many different tissues and organs. It is not easy, from the comparatively small number of cases which are recorded where no operation has been performed, to calculate the natural duration of the disease, but there are many cases to show that death may take place within a year or fifteen months from secondary growths in the lungs and other organs.

Sub-periosteal sarcoma of the *Tibia* usually attacks the upper end of the bone. The tumours are of slower growth than those of the femur, attack persons of rather more advanced age, are rarely, if ever, associated with affection of the lymphatic glands, and do not appear to affect the internal organs, or any tissues or organs, with secondary growths so frequently as do the tumours of the femur. They may be regarded, therefore, as inferior in malignancy to the tumours of the femur.

The number of cases of tumour of the *Fibula* is scarcely sufficiently large to allow of generalisation on their characters. They appear to affect the upper end of the bone, like the tumours of the tibia, but their course seems to be more rapid and the rate of growth quicker than that of the tibial tumours. They do not affect the lymphatic glands, but there is not sufficient evidence to show whether they are frequently associated with secondary growths in other organs and tissues.

Of the characters and course of the tumours of the *Scapula* I can only speak in modified terms, on account of the difficulty of distinguishing the tumours of sub-periosteal from those of central origin. As in considering the treatment of the scapular tumours I shall be obliged to consider all of them together without reference to their precise origin, I think it will be better here to include their course and characters in one description. My own impression is that the great majority of them are of sub-periosteal origin ; and this I judge not only from the accounts which have been given of their structure and conformation, but also from their rapid course and obstinate malignancy. The dorsal aspect of the scapula is usually affected, but the tumour may project on both surfaces of the bone, in the same manner as do many of the sub-periosteal sarcomas of the flat bones of the skull. The growth of the disease is almost always rapid, so that a very large mass may be formed in the course of a few months. The surrounding structures are early involved. Removal is usually speedily followed by recurrence of the disease. But the axillary glands are rarely affected. Secondary tumours may form in the lungs and other organs.

Sub-periosteal tumours of the *Clavicle* are not of common occurrence. So far as can be judged from the few cases which have been collected, they appear to be very malignant, returning quickly after removal, growing into the neighbouring lymphatic glands, and, through them, reaching those glands which are situated farther from the primary tumour. They may attack either end of the bone.

The tumours of the *Humerus* appear to be peculiarly malignant. Wherever they take their origin they spread with remarkable rapidity along the bone, so that they may affect its whole length and reach the upper and the lower end within a very few weeks after their first appearance. In spite of this rapid

course, there is no tendency to affection of the axillary glands Like other sub-periosteal tumours, but with much greater rapidity and certainty, they grow into the surrounding muscles. They may also extend from the humerus to the clavicle and scapula. Secondary tumours may occur in the lungs and other organs.

The *Radius* and *Ulna* are usually affected at their upper ends. The growths are apparently not so malignant as those of the humerus, but the number of cases which has been collected is not sufficient to allow of enlarged speculation regarding them.

Methods of Treatment for Sub-periosteal Sarcomas.—With few exceptions, amputation is the only operation which is practised for the cure of sub-periosteal sarcomas. The exceptions are the tumours of the scapula, the clavicle, and some of the tumours of the radius and ulna. For the tumours of the scapula, removal of the entire bone is usually practised; for tumours of the clavicle, resection of the whole or of the affected portion of the clavicle; and resection of the affected portion of the radius and ulna has been occasionally performed for sarcomas of the lower ends of these bones.

It will not be expected that I should here describe the methods of amputation of the limbs. They do not differ from those which are practised for other diseases which require amputation, the only special precaution being to amputate far above the disease.

I shall, however, make one exception to this rule, and shall describe tolerably fully what is generally known as Berger's method of amputation of the upper extremity, and I do so for this reason. Malignant tumours of the humerus are almost always of the head or upper third of the bone. Amputation at the shoulder-joint is therefore necessary for their removal. The disease has often spread into the tissues above the level of the shoulder-joint, so that mere amputation at the joint does not suffice for its removal. The removal of the scapula, nearly the whole of the clavicle, and the rest of the upper extremity can be performed with little or no greater danger to life than is incurred by the mere amputation through the shoulder-joint; and a sufficient description of the operation is only to be found with difficulty, as most of the English surgeons who have practised it and published an account of their successes have

assumed that the general outline of the operation is too well known to need repetition.

I have taken my description from Berger's own book, "L'Amputation du Membre Supérieur dans la contiguité du Tronc" (Amputation Interscapulo-thoracique) (Paris, 1887), but I cannot pretend to give the description in the terms of the original memoir, for it would occupy very many pages of this book. First, let me say that the patient is prepared for operation in the usual way, the axilla is cleared of hair on the night before the operation, and the parts are cleansed as I have advised in other sections (Breast, &c.). The patient is placed on his back, the arm a little drawn away from the side, and the operator stands outside the limb. The first incision is made along the line of the clavicle, beginning just internal to the attachment of the sterno-mastoid, and rather in front of the sternal end of the bone, passing to just behind the acromio-clavicular joint. The periosteum and soft parts are separated from the bone, the central third of which is resected. The subclavian artery and vein are exposed, and are divided between two ligatures, placed at least about a centimetre apart.

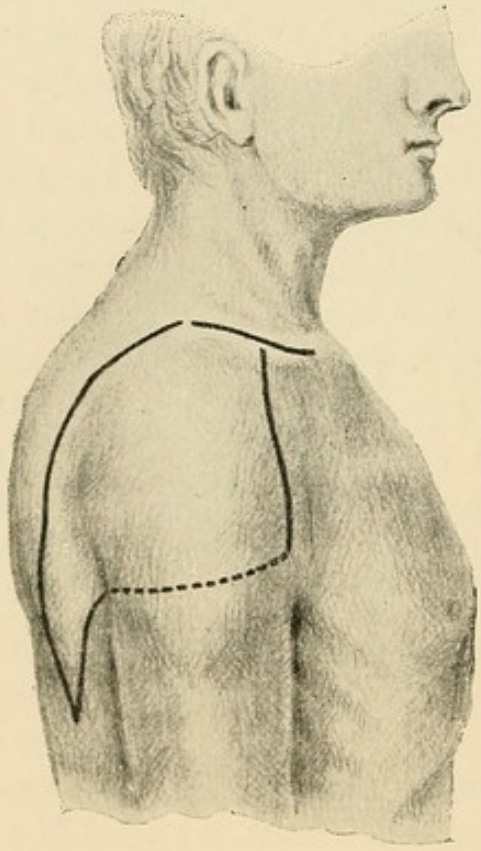
The limb is now drawn away from the body, and the operator, standing on the inside, makes the second incision, which commences about the centre of the first, passes outwards and downwards beyond the coracoid process in the groove between the deltoid and pectoral muscles. At the level of the junction of the anterior wall of the axilla and the arm, the incision crosses, beneath the pectoral tendon, the axillary aspect of the arm. The arm is raised and the incision is carried to the groove between the external border of the scapula and the muscular mass, and thence passes down to the angle of the scapula on the middle of its posterior aspect. The pectoral muscles are divided, and the sub-scapular space is reached. The vessels, such as the thoracic and the dorsalis scapulæ, are clamped as or before they are divided.

The arm is then placed beside the body, the shoulder raised, and the surgeon stands on the outer side. From the outer extremity of the clavicular incision, the third incision is carried as directly as possible towards the angle of the scapula, where it meets the lower extremity of the second incision. The integument is quickly raised off the surface of the scanula, and the

trapezius is separated from the clavicle and scapula. The remaining muscles which attach the scapula to the body are divided and the limb is removed.

The brachial plexus is divided between the ligatures which were applied in the first stage of the operation, and just after the formation of the anterior inferior flap.

FIG. 1.



The flaps come well together, forming an oblique line from above and in front to below and behind. In order that the steps of the lines of the incisions may be better understood, I have ventured to use the illustration in M. Paul Berger's book.* It will be seen that the third incision is almost a direct continuation of the first, and this is what is intended, and is arranged for in the slight obliquity of the clavicular incision. On the other hand, these incisions are not expected to be absolutely employed in every instance of amputation of the whole of the upper extremity. They are only intended to act as a guide for general use, and may be departed from or modified according to the conditions of the individual case.

In addition to the very free removal of the parts above the shoulder-joint, which this operation accomplishes, it ensures against severe hæmorrhage by the early ligature of the main artery, an advantage which cannot be overrated.

There are no operations which can be called "standard" for the resection of portions of the clavicle, the radius, and ulna for malignant disease; the operation depends on the extent

* Translation of note on p. 351 of Berger: NOTA.—The figure represents the tracing of the incision, after Farabeuf. The clavicular incision is marked by a thicker line. It is separated by a short interval from the incisions which limit the anterior and posterior flaps. The dotted line indicates the part of the anterior incision, which, passing beneath the limb, corresponds with the inner aspect of the arm and the axilla.

and relations of the disease in each individual case. It must be quite evident that resection of a portion of the clavicle for a tumour of even moderate size is a much more formidable procedure than resection of a portion of the radius or ulna, on account of the important relations of the clavicle. The tumour may extend to and actually press upon the subclavian vessels, the innominate vessels, the phrenic and pneumogastric nerves, the pleura, &c., one or other of which may be wounded in the course of the operation. Even the comparatively trivial hæmorrhage which flows from such veins as the external jugular and posterior scapular is abundant, and suffices to delay the progress of the resection and greatly to increase its danger.

In the former edition I described the operation for excision of the *Scapula*. It seems scarcely needful to do so now, as it is so fully treated in works on general and operative surgery. I would only make the following suggestions: that the greatest precautions should be taken against hæmorrhage by arranging for effectual compression of the subclavian artery, if necessary, through an opening made for the purpose. The vessels should be taken up with clamp-forceps before or as they are divided, if the bleeding happens to be severe. The incisions should be very free in order to afford the best possible exposure of the field of operation.

In addition to the complete removal of the scapula it may be found desirable at the time of the operation to remove also the head of the humerus or a portion of the clavicle. The clavicle has been removed, either in whole or part, in many of the cases in which the scapula has been excised.

On the other hand, the tumour may be so situated that the neck and glenoid cavity may be left behind; and although it is said that partial removals of the bone have been more fatal than the complete removal, I can scarcely imagine that a surgeon, finding it possible in the course of the operation to leave the shoulder-joint intact, and yet remove the disease very completely, would not take advantage of this circumstance.

After the removal of the bone and the closure of the wound, due care being taken that the most perfect drainage shall be arranged, the dressing which the operator prefers is applied. The arm and forearm are then fixed close to the side, and the patient is laid in bed. He may be placed on the opposite

side to that from which the bone has been removed, and, in the course of a few days, may be laid on his back, or inclining towards the back, so that the discharges may escape as quickly as possible. His position may be maintained by means of pillows.

Results of Operations.—Scapula.—Although the *Scapula* was taken last in the preceding paragraphs, it will be convenient to take it first in considering the results of operations. I have already said that it is often impossible to distinguish the tumours of sub-periosteal from those of central origin, not only before the removal of the disease, but even when the specimen has been dissected and examined with care. Many of the recorded cases of removal of the scapula for malignant disease do not contain anything in the account which allows the reader to discover whether the disease was of central or periosteal origin. I have therefore thought it well to include the tumours of both origins in this part of the chapter on the Bones, and to consider the mortality of the operation, and the prospects of the patient after recovery from the removal of the scapula, without reference to the exact origin of the disease.

In the last edition I used Poinsot's table in the *Revue de Chirurgie* (1885, p. 201), which contained a collection of forty-five cases of removal of the scapula, with a mortality of ten per cent. The bone had been removed for various reasons, but only in twenty-five of the cases for malignant disease. By what one may almost call a curious chance, the mortality in these twenty-five cases, instead of having been larger, was rather smaller than the mortality of the whole forty-five cases, and amounted only to eight per cent. At that time I thought a mortality of ten per cent. was by no means large for so serious an operation, especially as many of the operations had been performed before the general use of antiseptic surgery. The disease was, in some of the cases, of very considerable extent, and the hæmorrhage consequently severe. Most of the patients, however, were comparatively young adults, and otherwise good subjects for a severe operation.

In 1888 Doll put together all the cases he could collect of removal of the scapula for malignant disease (*Archiv f. klin. Chir.* xxxviii. 131), and that is the last collection of which I have any knowledge. It includes the cases contained in preceding collections, and the results are any-

thing but encouraging. There are only thirty-two cases in which the operation was limited, or almost limited, to the removal of the scapula. In the remaining thirty-three of a total of sixty-five cases, the entire upper extremity had been removed either at some previous time or when the scapula was removed. In thirteen of these thirty-three cases, the disease of the scapula was not primary, but recurrent, after removal of primary malignant disease of the humerus by amputation. The mortality due to the mere excision of the scapula reached the remarkable figure of eight deaths in thirty-two cases; and if the thirteen cases are added in which the scapula was removed for recurrent disease, the totals are forty-five cases, with ten deaths, more than twenty-two per cent., and more than twice the mortality following the operation in Poinsot's table. Of course these operations were, many of them, performed years ago, and allowance must be made for the greater mortality of that period. But only two of the patients died of sepsis. In six other cases, in which the cause of death is mentioned, it occurred from chloroform in one, from bronchitis in two, and from exhaustion in three. In Doll's whole collection of cases the mortality due to the operation amounted to even more than twenty-two per cent., nearly twenty-five per cent.

It is difficult to understand why there should be so large a mortality after this operation, and I cannot but believe that the same number of cases treated at the present time would show far better results. In order to have some idea of the results of the last few years, I examined our hospital statistics for the years 1888 to 1897 inclusive. But they only show six cases of malignant disease of the scapula, in three of which the disease was secondary. The scapula appears only to have been removed twice during those years. One of the patients died of the operation: the other recovered. In the *Transactions of the Clinical Society* three cases of removal of the scapula are recorded in the first thirty volumes. The patient in each case recovered. But the chief reason for recording them appears to have been the rarity of the disease and of the removal of the scapula.

I am afraid we must accept as a fact that the mortality due to the operation of removal of the scapula has been large hitherto, and can only hope that it may be much smaller under the conditions of surgery which prevail at present.

Complete Cures due to the Operation.—Unhappily, the results of the operations in the cases in which recovery took place are very discouraging. The results given in Poinsot's table were the following :

Died of the operation	2
Died shortly after recovery (probably internal sarcoma)	2
Dead or alive with recurrence or pulmonary affection	11
Amputation for recurrence	1
Lost sight of	3
Spoken of as "cured," duration unknown	4
Remaining well after eighteen months	1
Alive and well six years after operation	1
Total	25

The only patient who can be claimed to have been cured was Michel's, a man fifty years of age, from whom the whole of the scapula and the outer third of the clavicle were removed for a tumour which is described as "myeloid and cystic." The recovery was so excellent that the patient was able to perform the most laborious tasks in the fields six years after the operation. This tumour was probably of central origin and belonged to that variety of tumours of bone, the myeloid or giant-celled, of the malignancy of which there is some reasonable doubt.

Doll's results are even worse :

Died of the operation	8
Dead or alive with recurrence	12
Lost sight of	12
Total	32

The nearest approach to a cure of which I have any knowledge since the date of Doll's paper is to be found in Charters Symonds' case. It was published in the twentieth volume of the *Transactions of the Clinical Society* (1887) and is probably not included in Doll's paper, but it deserves to be better known because it is at least a very promising case. The patient was thirty-four years old, and the tumour was first noticed after a fall on the shoulder five months before he came under the care of Mr. Symonds. The tumour was of large size, and proved to be a fibrifying and chondrifying round-celled sarcoma, apparently of sub-periosteal origin.

The entire scapula was removed, with the exception of the acromion and coracoid processes (which were removed on account of suppuration five or six weeks later). The subclavian artery was compressed during the operation, and the other arteries which were cut were clamped or tied before they were divided. The incisions employed were one "across the top of the scapula from its posterior border over the acromion process, and from the centre of this a vertical one was carried downwards to the inferior angle." The dissection was carried from below and behind upwards. Recovery was retarded by suppuration about the portions of the bone which had been left behind. After their removal the patient was soon healed. The last note of him is, "The man was exhibited to the Society, it being now more than two and a half years since the operation. He was in good health and had a useful arm, being able to do all the lighter work of a carpenter, including the use of a plane. Overhead work he could not do."

This case is the more encouraging because, from the nature of the tumour and other circumstances, it was not peculiarly promising. Even without this small encouragement, it is certain that the scapula will continue to be removed for malignant disease in every instance in which the operation seems to hold out the least prospect of benefit; and it is to be hoped that the next ten or twelve years will furnish far better results, both in regard to the mortality due to the operation and the cure of the disease.

Clavicle.—In spite of two papers which have been published on removal of the clavicle during the last few years (Leguen, *Archives Sciences méd.* 1896, and Norkus, *Beiträge klin. Chir.* xi. 728, 1894), and that one of them (Norkus) is devoted to the extirpation of malignant disease, and contains an abstract of every case which the author has been able to discover during the present century, the number of cases at my disposal is extremely small. Norkus has put together thirty-five cases of malignant disease for which the clavicle was removed wholly or in part, but many of them were only mentioned during the discussion at some learned society, or very imperfectly reported. Even in one or two instances in which a full report of the case has been available this does not seem to have been studied, and the abstract appears to have been drawn up from a report at second-hand.

In place of two cases of sub-periosteal sarcoma, however, I have now seven cases at disposal, one of which came under my own care at St. Bartholomew's Hospital. Complete resection of the clavicle was performed in nearly every instance, and the operation was prolonged and difficult in several of them. In three of them the disease recurred very rapidly, and was not within the reach of a second operation. The fourth patient died within a few days of the operation, but apparently not of it, for secondary disease was found in the brain and lungs. One patient was lost sight of after the operation; and the best results which can be shown are that one patient was well two and a half months and another five months after the clavicle had been removed. The excessive malignancy of the disease was strikingly exhibited in the case which came under my own care. The patient was much older than most of those who suffer from sarcoma of the clavicle, for he was nearly sixty-eight years old. Three weeks before admission into the hospital, while travelling as a hawker, he suffered pain in the left clavicle. Ten days later he discovered a swelling at the painful spot, and two days before admission the clavicle spontaneously gave way. On July 8, 1895, I removed nearly the whole length of the clavicle, together with some lymphatic glands, which appeared to be affected. The patient made a very good recovery, but before he left the hospital there was already recurrence *in situ* and in the axillary glands, and this was quite beyond the reach of operation. These sub-periosteal sarcomas of the clavicle were usually round-celled, and in several cases made their way early into the neighbouring lymphatic glands.

Humerus.—*Mortality due to Operation.*—The operation necessary for the treatment of sub-periosteal sarcoma of the humerus is, in almost every instance, at least, amputation at the shoulder-joint; partly because the disease is often primarily seated at the upper end of the bone, partly because of the rapidity with which it extends along the bone when it takes its origin upon the shaft. We have therefore practically to consider the mortality of amputation at the shoulder-joint performed, not for accident, but for disease.

The mortality due to this operation was very large a dozen years ago, and amounted to about thirty per cent. or even more. I attributed it partly to the extensive nature of the

operation, and largely to the loss of blood, against which I thought insufficient precautions were taken. And, of course, many of the operations had been performed in the days before the general use of antiseptic surgery. I believed that greater attention to antisepsis and to the prevention of hæmorrhage during the operation would produce far better results, and I am happy to find that that prediction has been amply fulfilled. The mortality of amputation at the shoulder-joint for disease in my own hospital has fallen from a very high rate down to ten or eleven per cent. during the last eleven years, and I think it is likely to fall still lower. It is even more satisfactory to find that the mortality of the operations for removal of the whole upper extremity, including the scapula and all but the sternal end of the clavicle, is even lower than that of the usual forms of amputation at the shoulder-joint. These large inter-scapulo-thoracic amputations have excited much interest during the last ten years, and tables have been carefully compiled by Chavasse (*Transactions of the Medico-Chirurgical Society*, lxxiii. 81, 1890), Barling (*Transactions of the Clinical Society*, xxxi. 175, 1898), and Dent (*Transactions of the Medico-Chirurgical Society*, lxxxi. 221, 1898). Chavasse's table contains cases which go back many years; but it also contains ten cases in which the operation was performed during or after 1887 and up to 1889. One of the ten patients died of the consequences of the operation. Barling and Dent carry on the series from 1889 to the time of the writing of their papers, and show twenty-two cases with only one death; so that there is now a list of cases thirty-two in number with only two deaths due to the operation, a percentage of just over six in one hundred. I cannot but attribute the lower mortality of the larger operation in great measure to the preliminary ligature of the subclavian artery, and to the care taken in clamping or ligaturing the scapular arteries before or as they are divided, for I am sure that many deaths occurred directly or indirectly from excessive loss of blood during the performance of the school operation of amputation at the shoulder-joint.

Cures due to Operation.—I am sorry to have to tell a very poor story of the results of operations for the removal of sub-periosteal sarcoma of the humerus. Putting together the cases collected for the last edition and those collected since, there are eighteen patients who recovered from the operation,

and of whom something is known. Twelve of them were alive or dead with recurrence of the disease, and two others had suffered from recurrence, for which a second operation had been performed. They were well three and ten months respectively after the second operation. One patient died soon after the operation of unknown cause, and two died of metastasis without recurrence *in situ*. One was well sixteen months after the operation, one five and a half years, and one several years. The cases which exhibit anything like success are so few that it is worth while to study them a little more closely. Mr. Barling performed Berger's amputation on a man, thirty-seven years old, for a round and spindle-celled sarcoma of the upper two-thirds of the humerus of about seven months' duration. The operation was performed on February 19, 1897, and the patient was alive and well in June 1898. Nasse, in a very interesting account of the sarcomas of the long bones of the extremities in the Berlin Klinik during some years (*Archiv f. klin. Chirur.* xxxix. 888, 1889), relates the case of a man, thirty-nine years old, for whom amputation of the shoulder-joint was performed in 1883. The tumour occupied the lower end of the humerus, and had been growing for about thirteen months. Unfortunately, it does not appear to have been microscopically examined. This patient was alive and well in 1888. The third case comes from the Göttingen Klinik, and is mentioned in a paper by Reinhardt on the sarcomas of the long bones of the extremities, which had been observed there between the years 1880 and 1895. (*Deutsche Zeitsch. f. Chir.* xlvii. 523, 1898). The material on which this paper is founded is very rich, and it is extremely unfortunate that the author has employed it to so little purpose. The distinction between sarcomas of central and of periosteal origin is only maintained for a few of the cases. The results of the operations are given for all the bones together, and for tumours of various origin, and there are no detail tables such as are given in Nasse's excellent paper. All I can tell is that amputation at the shoulder was performed for a periosteal round-celled sarcoma of the shaft of the humerus, which had not yet grown into the soft parts, and that the patient was alive and well from eight to twelve years after the operation. It will thus be seen that the only two thoroughly successful cases were one in which the disease was

of the LOWER third of the bone, and one in which it was still so limited in extent that it had not grown into the soft parts. They just hold out the hope that early amputation in cases of sarcoma of the shaft and amputation at the shoulder-joint in cases in which the disease is of the lowest part of the bone may save the patient from the terrible disposition to recurrence *in situ* which is manifested by sub-periosteal sarcoma of the humerus.

Conclusions.—The number of cases from which to arrive at a conclusion as to the prospect of successful surgical treatment of sub-periosteal sarcoma of the humerus is very small. From the facts before us, however, we cannot but form the opinion that the disease is horribly and rapidly fatal, and that the prospect of complete cure, or even of long immunity from recurrence, is singularly small.

It is possible that the next edition of this book may furnish better results, for although Berger's operation has been performed a considerable number of times, it has not yet been sufficiently popularised to have become the routine operation of hospital surgeons for malignant disease high up in the arm. When this is the case, really good results may not be so rare as they are at present.

Radius and Ulna.—*Mortality due to Operation.*—In this case, again, the question at issue is that of amputation of the arm or of the forearm, generally the former, for disease. The amputations are singularly free from danger. The mortality of amputation of the arm twelve years ago was about nine per cent., and of the forearm about four to five per cent. I thought that a low rate of mortality at that time, and scarcely hoped that it would be improved. But at the present time the operations seem to be almost without danger to life. During the past eleven years the arm has been amputated at St. Bartholomew's Hospital for disease twenty-eight times without a death, and the forearm twenty-five times without a death. I do not know how many of these amputations were performed for malignant disease of the forearm; but amputations for malignant disease entail no special risk, and are often less dangerous than similar operations for other diseases.

Cures due to Operation.—On this point I have little more information to offer than I had years ago. I had then only been able to find an account of three cases of sub-periosteal

sarcoma of the radius and ulna. Amputation was performed through the arm in all three cases; but, in spite of this, both of the patients with disease of the ulna died, in each instance from the formation of new tumours, although there was no recurrence in the stump in either. The patient who suffered from a tumour of the radius was more fortunate. I learn from Mr. Berry, who saw the case, that she was alive and well six years after the amputation. I am not aware of a single case of sub-periosteal sarcoma of either radius or ulna at my own hospital during the last ten or eleven years; and the collections of cases from the Berlin and Göttingen Kliniks reported by Nasse and Reinhardt, and amounting to about 100 sarcomas of the long bones of the extremities, do not furnish a single case. The disease is evidently excessively rare.

Conclusions.—The only conclusions at which we can arrive are that amputation performed for sub-periosteal sarcoma of the bones of the forearm is not a dangerous operation, even if the amputation is performed through the arm. How far it will afford immunity from the disease there is little evidence to show, although it may, with confidence, be said that there is very little likelihood of recurrence of the tumour in the stump, provided the amputation is performed well above the disease.

Femur.—*Mortality due to the Operation.*—With scarcely any exception, the operations performed for the cure of sub-periosteal sarcoma of the femur are amputation, either at the hip-joint or high up in the thigh. The very large majority of operations for central sarcoma are also through the same parts. So that the figures which apply to sub-periosteal sarcoma apply also to all sarcomas of the femur. In the former edition I put together a large number of amputations through the hip and thigh, in which the operation was performed for disease, but I did not separate those in which the amputation was performed for malignant disease. Although I was able to furnish proof that the mortality following such operations had been considerably diminished by careful attention to antiseptic measures, it still appeared to me very high; and I thought the mortality due to amputation at the hip, especially, ought to be materially reduced by still greater attention to antisepsis, by greater care in preventing hæmorrhage during the operation, and by adopting, where it was possible to do so,

Furneaux Jordan's method of amputating. The mortality of amputation at the hip-joint *generally* is larger than that following amputation for malignant disease, for many of the general amputations are performed for the removal of very advanced hip-disease, and the conditions are often eminently unfavourable to recovery.

I shall now be able to show, although not in very large numbers, that the mortality has already been largely diminished, and I believe that it will be still smaller during the next few years. Amputation at the hip-joint for sub-periosteal and central sarcoma of the femur was performed forty-seven times, with eleven deaths—just under twenty-five per cent. Not a very large majority for so considerable an operation. But whereas eight deaths occurred in twenty-three cases in the last edition, there were only three deaths in the twenty-four cases which I have now added. The mortality has therefore been reduced, on this formidable operation, from more than thirty per cent. to twelve per cent.

One hundred-and-one amputations, through the thigh, were performed for malignant disease of the bones of the lower extremity. The very large majority of them were performed for sarcoma of the femur, and were, therefore, through the upper part of the thigh. The total mortality was twenty; in other words, just twenty per cent. But eighteen of the twenty deaths occurred in the old series of cases, sixty-six in number; while only two deaths occurred in the later series, which counted thirty-five cases. The mortality has therefore fallen from more than twenty-seven per cent. to less than six per cent. And these statistics are not compiled from records of cases which were published on account of successful operations. They comprise, in most instances, the total experience of various clinics, and are reported, not so much in relation to the operation, as to the disease. There is every reason to believe that the results of the next decade will be even better, particularly for amputation at the hip-joint.

Cures effected by Operation.—There is unfortunately little in this section that is pleasant to record. In addition to the cases which were collected for the first edition, I have put together thirty-two more, of which seven are recorded in Nasse's paper (*loc. cit.*); seventeen in a paper which was written by Mr. Colby and myself (*St. Bartholomew's Hospital Reports*,

xxxi. 31, 1895); five by Borck from Trendelenberg and Madelung's Klinik (*Archiv f. klin. Chir.* Bd. xl. 941, 1890), and three cases which I reported in a short paper in the *Practitioner* in 1896. The total number is sixty-eight, and the results are very depressing:

Died of the operation	12
Lost sight of	14
Dead or alive with recurrence	11
Dead or alive with metastasis	13
Dead of either recurrence or metastasis	11
Well seven months after operation	1
Well from one to two years	4
Died of uncertain cause three years after operation	1
Well eight years after operation	1
Total	68

There is only one case in which the patient seems really to have been cured by the operation; and, when I analysed the account of the case some years ago, I could not but doubt whether it was not rather one of central than of sub-periosteal sarcoma. The case in which the patient died of some uncertain cause, three years after the operation, was also quite unusual in many of its features, and I have drawn attention to its peculiarities in the paper referred to (*St. Bartholomew's Hospital Reports*). The man was thirty-nine years of age, and it was not until the disease had existed for about seven years that amputation was performed through the thigh. The three patients who were alive and well less than three years after the operation had, each one, only lived just a year or fourteen months; and, in one of the three, the year was counted after a second operation, amputation at the hip-joint, for recurrence of a spindle-celled sarcoma of the lower third of the bone. One of the cases recorded by Nasse is worthy of notice, for the patient might have been regarded as cured by the operation at the end of three years had the observation only been carried up to that point. The hip-joint was amputated for the removal of a chondrifying sarcoma of the shaft of the femur, as large as a cocoanut, which had been noticed only three months previously in a girl eighteen years of age. Four years and eight months later she died of a very large local recurrence of

the disease and metastasis in the lungs. The report does not state how long these troubles had been noticed, perhaps for a long period, and the disease, contrary to its usual habit, had grown very slowly. But, however it may be regarded, the case is a very unusual one. The structure of the tumour seems to have very little influence on its course; round-celled, spindle-celled, and mixed-celled tumours were equally, and equally quickly, fatal. The large majority of the amputations were performed through the femur, but in those in which the operation was through the hip-joint the results were not a whit the better. Of course, there are the fourteen cases which were lost sight of within a few weeks of the operation. There may be some successful cases among them; but I have very little hope of this. The cases which were followed up by Mr. Colby and myself were almost invariably fatal, and in the large majority of them death occurred within a few months of the amputation. In many of the cases amputation was performed within three months of the first observation of the disease; in some of them within a few weeks. From every point of view I cannot but regard sub-periosteal sarcoma of the femur as a remarkably deadly disease, and I am not yet clear that surgery can do more than palliate the distress occasioned by it, and that only in a comparatively few cases. The only hope for the future is in very early diagnosis and in very high amputation. Seeing that diagnosis of the real nature of the disease, within two months of its onset, is usually extremely difficult, and that a correct diagnosis was only made at the end of three or four months in many instances, it is evident that early operation will not be performed unless some more certain means are discovered of diagnosing the disease in its earliest stages. I hoped that the Röntgen rays might have proved useful; and they may still be so. But in the many cases in which I have now used them, they only afforded confirmatory information of a diagnosis which might quite easily be made without them; and in one case in which I strongly suspected the presence of a sarcoma, and in which there actually was one, the skiagraph was so negative as to be misleading. With regard to high amputation, I have been much impressed by the wide area of infectiveness of the primary tumour in some of my own

personal cases. Both the soft parts and the bone are diseased some inches above the apparent limit of the tumour. In order to impress this more forcibly on my readers, I append illustrations of two tumours of the femur which were photographed after removal. They show how high the section was made above the disease in both cases. Yet local recurrence

FIG. 2

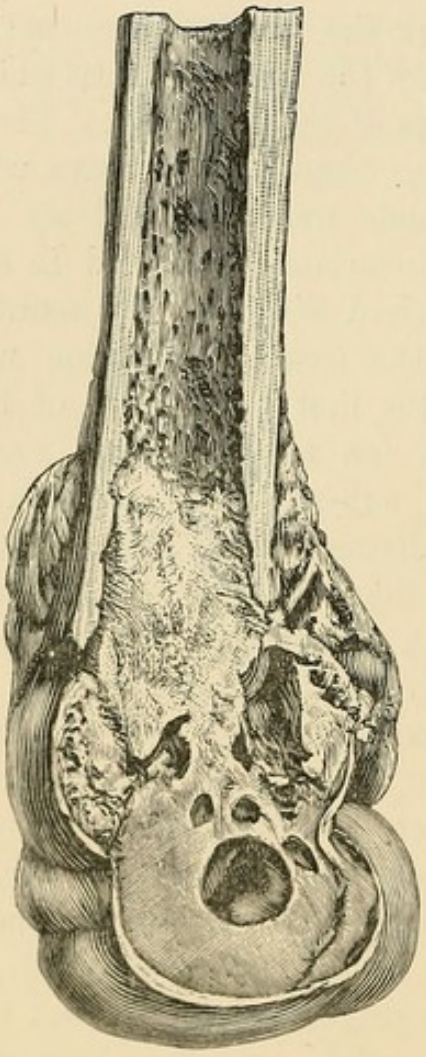
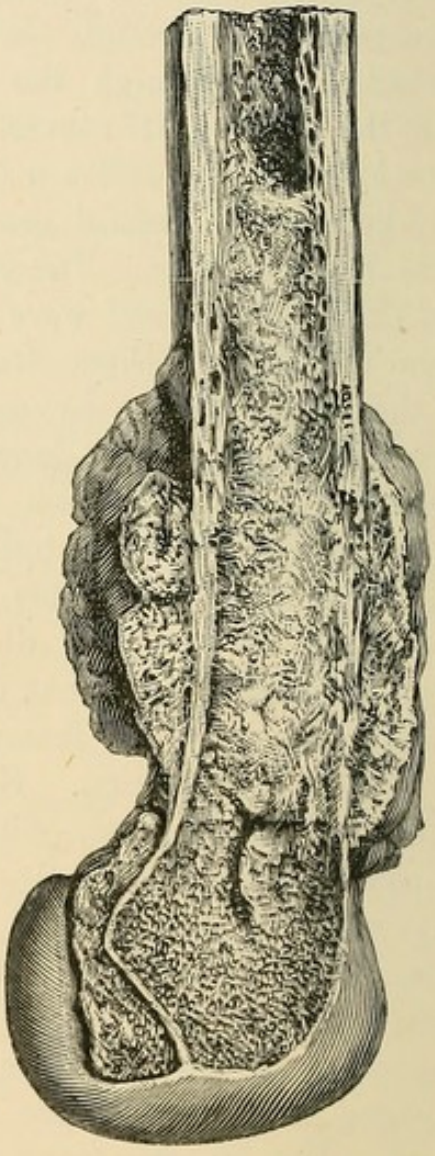


FIG. 3



occurred in both; in one of them only in the soft parts, but in the other, in the bone as well as in the soft parts.

Under these circumstances I think it is expedient to try what amputation through the hip-joint will do for sarcomas of moderate or small size of the lower third of the femur. There are, of course, two very strong reasons against amputation through the hip if amputation at the junction of the

middle and upper thirds of the bone will suffice: the heavy mortality of the operation and the greater helplessness of the patient afterwards. The heavy mortality can be lessened by such precautions as are now taken in amputation of the whole upper extremity by the frequent adoption of Furneaux Jordan's method of amputation, and by the strictest attention to antiseptic or aseptic methods; and as many of the patients are young, they are more capable than older persons would be of adapting themselves to their mutilated condition.

Conclusions.—Everything leads to the belief that, in the present state of our diagnosis of sub-periosteal sarcoma of the femur, amputation of the limb holds out really no prospect of permanent success.

As a palliative measure, however, the operation, even if it be amputation through the hip-joint, is more than justifiable. It should be performed in every instance in which it is possible for the relief of the patient. Even if the disease recurs *in situ*, the recurrent tumour may often be removed successfully in so far that the patient remains relieved of the local trouble until death has taken place by metastasis.

Tibia and Fibula.—*Mortality due to Operation.*—To the former series of twenty-three cases I have added twelve from the two papers alluded to in the preceding section. The total is now thirty-five cases. Of these, only one proved fatal from the operation, a very small rate of mortality when it is remembered that many of the operations were performed before the days of antiseptic surgery, and that most of them consisted of amputation through the lower third of the thigh. I think that the mortality of the operation practised for sarcoma of the bones of the leg ought not to be larger than this at the present time. The disease is very rarely ulcerated at the time of operation, so that no special septic influences are to be feared. Nor are the patients usually in bad condition for amputation, particularly as many of them are young adults. Amputations for malignant disease of the bones of the leg ought, therefore, to yield the lowest rates of mortality consistent with the extent of the operation.

Cures due to Operation.—Although the records are not so desperate as those of operations for sub-periosteal sarcoma of the femur, they are thus far not at all encouraging so

far as cure of the disease is concerned. They stand as follows:

Died of the operation	1
Lost sight of	13
Dead or alive with recurrence	3
Died of metastasis	11
Died soon after operation (probable metastasis)	2
Well from one to two years	4
Well seven years later	1
Total	35

The only hope of improving the statistics of these two series of cases is in following up the patients who were lost sight of, and those who were well from one to two years after the operation. Probably this would furnish a small proportion of successful cases. But the history of the cases which were actually observed is not promising for a large percentage of success. Taking out the one patient who died of the effects of the operation, and the thirteen who were lost sight of after recovery, there remain twenty-one persons. Eleven of these —that is more than half of them—are *known* to have died of metastasis, and two others were suspected to have died of it, while three patients died of recurrence, plus metastasis, which thus accounts for sixteen out of the twenty-one. This liability to metastasis is the most unpromising feature of the disease. Were it not for this the prognosis of the disease should be very good, for the records show how readily the patient is protected against local recurrence by an operation. That there are, however, cases of sub-periosteal sarcoma of decidedly less malignancy is proved by the two following cases. A woman, seventy-two years old, who suffered amputation of the thigh for the removal of a calcifying sarcoma of the upper third of the tibia of about eight years' duration, remained well until her death from old age seven years later. A young man, twenty-one years old, had for eighteen months a tumour at the junction of the upper and middle thirds of the tibia. It was about the size of a Tangerine orange, and was removed from off the surface of the bone in October 1886. It was a spindle-celled tumour, but contained bone, calcareous matter, and mucous tissue. In January 1887 a recurrence was removed, and in May of the same year a second recurrence was removed.

It was composed chiefly of oval and round cells. He was perfectly well in health at the time of the third operation, and presented no signs of metastasis, so the tumour must be regarded as an example of a mild type of sub-periosteal sarcoma. The further history of the case has not been traced.

Conclusions.—In spite of the small measure of success which is recorded in the foregoing paragraphs, there can be little question that sub-periosteal sarcoma of the tibia and fibula will continue, and will continue rightly, to be treated by amputation.

When the disease is seated in the lower third of the leg, the limb may be amputated safely through the leg just below the knee; when it is of the upper third, the amputation must be through the lower third of the thigh.

Recurrence of the tumour in the stump may be almost certainly avoided.

Although the present records show that there will certainly be many failures in the attempt to procure permanent relief from the disease, they also show that the operations themselves have not proved very fatal; more complete and extensive records may afford, and probably will do so, a moderate percentage of complete cures due to operation.

Central Sarcomas attack the same bones as the sub-periosteal sarcomas, and may be considered in the same manner and order as the sub-periosteal tumours.

The central sarcomas of the *Femur* occur, in the large majority of instances, in the lower end of the bone, sometimes affecting one condyle, but more often gradually replacing the whole of the cancellous tissue, expanding the cortical portion until it appears as if blown out by the disease within it. Adults are attacked far more frequently than children. The disease usually runs a slower course than sub-periosteal sarcoma, is not so often mixed with bone or cartilage, does not tend to affect the groin glands, and is comparatively rarely generalised. In every respect it appears to be a less malignant disease than the corresponding variety of sarcoma which takes its origin beneath the periosteum. The least malignant of the different varieties of central sarcoma is the myeloid or giant-celled tumour.

The central tumours of the *Tibia* have as great a tendency to affect the upper end of the bone as those of the femur have

to affect the lower end. They pursue a slower course than the sub-periosteal tumours of the tibia, grow more slowly, have no tendency to affect the groin glands, apparently only seldom become generalised, and, in truth, are generally less malignant than the corresponding varieties of sarcoma of sub-periosteal origin of the same bone. They may attain a very large size and may destroy the upper end of the bone and make their way into the joint.

The central tumours of the *Fibula* also affect its upper end, and appear to be less malignant than the corresponding tumours of sub-periosteal origin. But the number of cases which has been collected is so small that it would not be right to draw from them very decided conclusions.

The *Humerus* is almost always affected at its upper end, and a tumour is produced which gives to the shoulder much the form of a leg of mutton. There is a wide difference in the course of these and of the sub-periosteal tumours ; for whereas the latter are very malignant and very rapidly fatal, the central tumours are of much slower growth, are not disposed to involve the surrounding structures, and have apparently no marked tendency to become disseminated. The instances of generalisation appear to be for the most part instances of multiple sarcomas, rather than of dissemination proceeding from a single primary growth. The central tumours usually affect older subjects than the tumours of sub-periosteal origin.

The central sarcomas of the *Radius* and *Ulna* almost invariably affect the lower end of the bone. They exhibit a modified malignancy, not tending to affect the lymphatic glands, or to produce secondary growths in the organs and tissues. They usually grow slowly, and are for a long period enclosed in the interior of the affected bone.

Central tumours of the *Clavicle* are very rare, and little can be said with regard to the course they pursue.

The account of the central tumour of the *Scapula* is included in that of the sub-periosteal tumours.

Methods of Operation.—In considering and estimating the various methods of dealing with the sarcomas of central origin, it must be borne in mind that there is great difference in the relation which the tumour bears to the bone in many instances. Some of the growths are enclosed in cavities in the interior of the bones, which are smooth-walled, clearly defined,

and from which they can be shelled out without the slightest difficulty. This is perhaps more frequently a condition of giant-celled tumours, and of tumours of the bones of the forearm and leg. Other central growths are certainly well defined, but are at the same time only separable with difficulty from the surrounding bone. It can easily be seen that the treatment must be largely influenced by such conditions as these, quite apart from the importance and situation of the affected bone. It is not usually possible to distinguish accurately these relations until the tumour has been exposed, so that the treatment may need to be modified at the time of the operation. I have thought it well to preface what is to be said regarding the methods of operation with these remarks, because they apply to all central tumours of bone.

Three different operations have been practised for the relief of patients suffering from central tumours—enucleation of the tumour, resection of the affected portion of the bone, and amputation of the limb.

I shall not attempt to describe the last two operations, for the manner of the resection must obviously depend on the bone and part of the bone to be resected, and on the size and relations of the tumour. And the amputations for central tumours do not differ in any respect from those which are performed for disease of other kinds, the only essential point being that the incision should be well above the upper limit of the tumour. It may not, however, be amiss to remark that resections for the removal of central tumours are likely to be less severe than resections for sub-periosteal disease on account of the exact limitation of the central tumours (when they are suitable for resection), and the immunity of the surrounding structures.

Enucleation of a central tumour may be performed in the following manner:—After due preparation of the patient and of the part to be operated on, the circulation through the limb is arrested (if the tumour is situated in one of the bones of the limbs) by means of Esmarch's apparatus. A free incision is made in the long axis of the tumour over that part of it which is least covered by the soft structures. The shell of bone which covers the tumour may be very thin at this point, and egg-shell crackling may be evident. The bone is bared of the periosteum. An opening is made into the cavity

which contains the tumour by cutting away with chisel or bone-scissors a portion of its wall, and the extent of the tumour and its relation to the cavity are investigated. If it is clearly defined, and, better still, easily separable from the surrounding bone, the entire tumour may be shelled out, or it may be scooped out with a Volkmann's spoon. Doubtful areas of the interior of the cavity may be treated with the actual or the thermo-cautery. The cavity is thoroughly washed out with an antiseptic solution. When the Esmarch's apparatus has been removed, if there is much hæmorrhage it may be plugged with strips of gauze. Bleeding vessels in the superficial wound are then tied, the wound is left open and dressed in such a manner as the operator may choose. The cavity is allowed to heal up from the bottom, a process which of necessity occupies a considerable time when it is of large size. It must be borne in mind that the operation of enucleation may be unsuitable in cases of easily separable tumours, when the growth has been permitted to attain so large a size that the surrounding bone has been reduced to a mere shell, too thin and fragile to support the weight of the parts beyond.

Clavicle.—To the three cases contained in the last report, I have been able to add three more taken from Norkus' paper (*loc. cit.*) and one from the *Transactions of the Clinical Society*, xxiv. 12 (Sutton). Either the whole or the affected portion of the clavicle was resected in all of them. Three were lost sight of after the operation, from which all recovered. In two of them the disease recurred within three months of the operation. The sixth case is the celebrated case in which Valentine Mott, the American surgeon, performed the operation of resection of the entire clavicle with the affected skin over it in the year 1828. The patient died at the age of seventy-three in the year 1883. Bland Sutton's case was also very successful, for the patient was alive and well three years after the operation. The case is unusual in several respects. The tumour was typical myeloid, and was situated in the acromial end of the bone. Only the acromial half was resected, and the operation was attended with complete success. This is the only instance of myeloid disease with which I am acquainted.

Results of Operations: Humerus.—*Mortality of the Opera-*

tion.—The situation of the disease in the upper third of the bone, and its close connection with the surrounding structures, together with the large size it usually attains, and the consequent destruction of the bone, are not favourable to attempts to enucleate central sarcomas of the humerus. Nor can much be said in favour of resection. The only treatment which appears to offer a reasonable prospect of success is amputation of the upper extremity.

In the last edition I had only eight cases of which to avail myself for the study of this disease. I have added to them twelve others, which bring the total up to twenty cases. This is a very small number, but it is difficult to find any collections of cases of sarcomas of the long bones which contain many cases of central sarcoma of the humerus. Four of the patients died of causes directly connected with the operation, making a total mortality of twenty per cent. Happily, however, while the first eight cases afforded a mortality of three, the later twelve cases afford only a mortality of one; so that the hope I expressed in the last edition that the mortality due to this operation would be largely diminished by care in the avoidance of hæmorrhage is fully borne out. Yet the operations were for the most part much larger than mere amputation through the shoulder-joint, and comprised generally the removal of the entire upper extremity. The only patient who died in the last twelve cases died of exhaustion consequent on the extent of the operation, which included resection of the first rib and sternum and ligature of the inferior (?) vena cava!! (Nasse).

Cures due to the Operation.—Formerly I could not adduce a single instance of cure; and even now, although I have better things to relate, the results are not satisfactory. Four of the patients died of the results of the operation, and six were lost sight of within a few months; so that there only remain ten patients to account for:

Died of recurrence	2
Died of metastasis	1
Well from one to two years	5
Well more than three years	2
Total	10

Naturally, one desires to know the character of the cases in which the operation proved successful. The entire upper

extremity was removed by Berger's operation in both the completely successful cases; in one instance for a myeloid and in the other instance for a round-celled sarcoma. The former patient was alive and well three years, the latter six years after the amputation. In three of the five cases in which the patients were alive and well for the period of from one to two years, Berger's operation had been performed. The nature of the disease was not by any means apparently favourable to a happy issue. On the other hand, in two of the unsuccessful cases, the disease is described as a myeloid sarcoma. One of the two patients died, seven months after Berger's operation, of metastasis in the lungs; the other, six months after a similar operation, of recurrence and metastasis.

Conclusions.—Although the information which is at present before us is not sufficient to allow of large generalisation, there can be no doubt that the prognosis of central sarcoma of the humerus is not quite so black as I was disposed to paint it a dozen years ago. The removal of the entire upper extremity by Berger's method or some modification of it will probably offer a reasonable hope in a certain proportion of cases of a successful issue; and the mortality due to the operation need not deter the surgeon or the patient under ordinary circumstances. The loss of the entire upper extremity is, of course, a terrible mutilation; but I am afraid the nature and the situation of the disease preclude any attempt at conservative surgery, unless, indeed, the diagnosis of the disease can be made while it is still of small extent and enclosed within the epiphysis of the bone.

Radius and Ulna.—*Mortality due to Operation.*—I have now seven cases to add to the nine reported in the last edition, making a total of sixteen cases of central sarcoma of the radius and ulna. The disease was treated by each of the three methods of which mention was made in the introduction to this section—namely, scooping-out, resection, and amputation. Scooping-out was only practised in one or two instances, but resection was performed in eight cases, while amputation was performed in the remainder. One patient died of the operation (resection of the lower part of the ulna), and the cause of death was chronic pyæmia, but this was many years ago. I do not know what the relative danger of the three methods of treatment may be, for there are not sufficient cases recorded to

allow a judgment to be formed. But I should estimate resection to be the most dangerous, although it may probably be practised again and again without fatal consequences in the present condition of surgery. Amputation of the forearm or through the lower part of the arm appears, from hospital statistics, to be almost free from the danger of a fatal result.

Cures due to the Operation.—The results of the operations prove to be extraordinarily good :

Died of the operation	1
Lost sight of	5
Died of recurrence	1
Well from one to two years	1
Well from two to three years	2
Well more than three years	6
Total	16

Of the ten patients, therefore, who were kept in sight, only one died of recurrence of the disease. The case is recorded by Nasse, who says the tumour was a round celled sarcoma, which had apparently originated in the diaphysis of the radius. The arm was amputated. Within a few months the axillary glands became affected and were removed; and, not long afterwards, the entire upper extremity was amputated, but death followed shortly afterwards from affection of the lungs. Several reasons render it doubtful whether this tumour was really of central origin. At the time of the first operation, fifteen months after the tumour had been first observed, the radius was almost completely destroyed, the ulna was affected, and the entire forearm from the elbow to the wrist was involved in the disease. The account of the conditions and of the latter history of the disease are very suggestive of periosteal sarcoma.

Six of the patients may be claimed as cured, and three others were in a very hopeful condition. The results are the more surprising because the operation which sufficed for the cure of three of the six successful cases was resection of the affected portion of the bone. The duration of cure was four years in two cases, more than eight years in one, ten years in two, and thirteen years in the sixth case, so that there cannot be any doubt of the stability of the cure.

But, now, it must be admitted that the variety of sarcoma

in five of the six cases was giant-celled or myeloid, and that this was the nature of the disease in at least three-fourths of the sixteen cases. This extraordinary liability of the bones of the forearm to this variety of tumour is very difficult to comprehend, and can only be regarded as a very fortunate circumstance. Lest that should be esteemed to be the sole explanation of the relatively benign character of central tumours of the radius and ulna, I would point out that a spindle-celled sarcoma was scooped out of the lower half of the ulna of a man twenty years of age and the patient was quite well two years later; and that a mixed-celled sarcoma was scooped out of the lower end of the radius of a woman thirty-five years old. The disease recurred and the portion of the radius was resected. Again the disease recurred and the forearm was amputated. Ten years later this patient was in good health. In the last case it will be observed that, after two local recurrences, amputation of the *forearm* sufficed for the cure of the disease.

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Conclusions.—From the evidence before us it seems clear that the malignancy of central sarcomas of the bones of the forearm is very limited, partly on account of the situation of the disease, partly on account of the variety of sarcoma to which these bones are liable. If the tumour is contained thoroughly within a cavity in the bone, and can be easily separated from the wall of the cavity, an attempt may be made to scoop it out. If it cannot be scooped out, the diseased portion of the bone may be resected. A useful hand and wrist may be obtained, even after resection of a large fragment of either the radius or the ulna. Either scooping out or resection may be successful in curing the patient, but either may be followed by recurrence.

Recurrence of the disease should be treated by amputation of the forearm, which can generally be safely performed about the middle of the bones.

Femur.—*Mortality due to Operation.*—To the thirty-three cases in the first edition, I can now add thirteen more, taken from the various sources mentioned in the preceding paragraphs. In four of them the disease was treated by resection, in thirty-one by amputation through the thigh, and in eleven by amputation at the hip-joint. The total number of deaths due to the operation was eleven: three after amputation at the

hip, six after amputation through the thigh, and two after resection. At the present time this would naturally be regarded as a very high rate of mortality, in spite of the serious gravity of the operations, and I should find it difficult to explain it. Happily, the explanation lies ready to hand. The deaths almost all occurred before the true antiseptic period. It will therefore be found that, while there were ten deaths in the thirty-three cases recorded in the first edition, there is only one death in the thirteen cases I have now added to them. Three amputations at the hip-joint, seven through the thigh, and two resections (in one of which amputation was performed six months later) yield only one fatal result. One patient died after amputation of the thigh. From these later results I think we are justified in expecting that operations for the removal of central sarcoma of the femur will, in future, be followed by a very low rate of mortality. Provided great care be taken to prevent loss of blood during the performance of the operation, particularly in amputation at or close to the hip-joint, and strict aseptic or antiseptic measures be adopted, the conditions are generally particularly favourable to recovery. The patients are rarely advanced in age, and are seldom seriously weakened by the presence of the tumour.

Resection will probably not be frequently performed for sarcoma of the femur, unless the diagnosis of the disease is made much earlier than it has been hitherto. The records of the four cases in which it was performed are not encouraging. In one of them the disease was situated in the upper epiphysis of the bone, and when the patient died of the operation, he was found to be already suffering from secondary disease in several parts of the body. In the second case six inches of the lower end of the femur were removed by Billroth from a young woman who would not submit to amputation. She gradually sank and died of septicæmia, and had she recovered from the operation it is difficult to believe that the limb could have been of use to her. Nasse reports two cases from the Berlin Klinik. In one of them the lower epiphysis of the femur was the seat of the disease. The knee was resected in October 1883. There was early recurrence, and in March 1884 the thigh was amputated: the patient was well and free from recurrence between three and four years after the second

operation. The other case was that of a woman thirty-one years old, who apparently had not long been the subject of a spindle-celled sarcoma the size of an apple in the external condyle of the femur. The knee was resected at the beginning of 1886, and she was quite well when seen in 1889. This case encourages the hope that a useful limb may be procured for the patient in cases of central sarcoma in which the disease is limited in extent and is diagnosed at a very early period.

Cures due to Operation.—Although eleven deaths due to operation and eighteen cases lost sight of within a few weeks or months after their recovery sadly diminishes the number of my cases, the results in those which remain are very encouraging, and serve to show what a wide difference there is in the relative malignancy of sub-periosteal and central sarcomas of the femur:

Died of the operation	11
Lost sight of	18
Dead or alive with recurrence, with or without metastasis	2
Dead of metastasis	5
Dead soon of unknown cause	2
Well nine months later	1
Well from one to two years later	2
Well more than three years later	5
Total	46

The number of cases of recurrence *in situ* is singularly small, and points to a very limited local malignancy of the disease when compared with that of the sub-periosteal sarcomas. Nor is it probable that a closer knowledge of the cases lost sight of would furnish a much larger proportion of cases of local recurrence. Recurrence *in situ* not merely drives the patient back to the hospital, but generally to the surgeon who performed the operation for removal of the primary disease; hence the history of the case is readily followed up, and recurrence of central sarcoma is often likely to be within reach of a second operation.

The two patients who died soon were both operated on in the Berlin Klinik. In one of them the cause of death appears to have been quite unknown, and the statement is merely made that the patient died soon after recovery from the operation. The other patient died of pneumonia nine months after the opera-

tion. The primary tumour was a giant-celled sarcoma, and the autopsy showed that there were no metastatic deposits.

Just as in the cases of sub-periosteal tumour, by far the most frequent seat of metastasis was the pleura and lung, and this whether the primary tumour was round-celled, spindle-celled, or giant-celled. Indeed, in two of the five cases, the primary growth was giant-celled; and, in a third case, is reported to have been composed partly of spindle, partly of giant cells.

Taking the successful or hopeful cases: of those who were well from one to two years after the operation, one was a patient who suffered from giant-celled sarcoma of the lower end, the other from a spindle-celled sarcoma of the upper epiphysis of the bone, for which amputation at the hip-joint was performed. The disease had been noticed for about nine months, and two years after the amputation the patient was quite well. Five patients may be regarded as cured by the operation, for they were well at periods of from three to eight years. In one of them the disease was giant-celled and of the lower end of the femur. The limb was amputated above it and the patient was well three years later. In two cases the disease was spindle-celled and of the lower end. One of them was the patient whose case has already been alluded to in connection with the successful resection of the knee. The other was a young woman, nineteen years of age, who suffered amputation at the hip-joint for the removal of a spindle-celled sarcoma which had been growing about six months. The glands in both groins were enlarged at the time of the operation, but they subsided after it, and the patient was well five and a half years later. In the two remaining cases the microscopic structure of the disease is not mentioned. Amputation through the thigh served so well that one of the patients was well four years, the other eight years after the operation. Reinhardt records one of these cases, and says the tumour was the size of a child's head. The other is contained in Nasse's paper. Resection of the knee was first performed, but speedy recurrence of the disease compelled amputation of the thigh.

Five completely successful cases out of twenty-eight cases of which the results were known, and three more cases of possible success, is a very great improvement on the results I was able

to report some years ago, and offers a very hopeful prospect for the future.

Conclusions.—Central sarcomas of the femur are rarely within the compass of the operation of resection, and still more rarely within that of scooping-out. But if the diagnosis can be improved so that the nature of the disease can be determined at a much earlier period of the disease, and while it is still of very limited dimensions, the operation of resection may probably be much more frequently performed, and with success.

Amputation at the hip-joint is rarely necessary for tumours of the lower epiphysis, which can often be dealt with very successfully by amputation through the thigh well above the limit of the affected portion of the bone.

There is every reason to hope that the future has in store a larger percentage of successes and a smaller mortality due to the operation.

Tibia and Fibula.—*Mortality due to Operation.*—To the twenty-nine cases in the last edition, I have added twenty-three cases taken from the sources already cited, thus making a total of fifty-two cases. Amputation through the thigh or at the knee-joint was practised in thirty-six of them; amputation of the leg in two; "removal" of the disease in four; resection of the affected portion of the bone in four; and scooping-out in six cases. The total mortality due to the operations was nine, and as several of the patients were operated on twice or even more times, first, for example, by scooping-out or resection, later, by amputation, the mortality is not really at the rate of about eighteen per cent., as it appears at first sight. In respect to the future mortality of operations for central sarcoma of the tibia and fibula, whatever be the nature of the operation, there can be no doubt that the risk will be very much diminished. All the nine fatal cases occurred in the twenty-nine cases of the first series. In the twenty-three cases which I have now added there is not one fatal case. Of course, it cannot be expected that the thigh should be amputated in a vast number of instances without a fatal result, but I believe the future mortality will be very small. I could not explain the high rate of mortality in the twenty-nine cases which I used on the last occasion, as it was considerably larger than the mortality following similar operations for various

diseases, and I could see no reason why amputation for central sarcoma of the bones of the leg should be exceptionally large. Indeed, it appeared to me that the mortality of such operations ought to be less, not greater, than that which is due to amputations for many other diseases: for senile gangrene, for example. The absence of a fatal result in the new series of twenty-three cases fully bears out this opinion.

Cures due to Operation.—In every respect the additional cases are very satisfactory, for only a few of them have been lost sight of after recovery from the operation. The total results for the fifty-two cases are the following:

Died of the operation	9
Lost sight of	19
Died within a year of other or unknown cause	4
Died of recurrence or metastasis	2
Well from one to two years	7
Well from two to three years	2
Well more than three years	9
Total	52

So that, against one case which could be claimed as cured in the first series of twenty-nine, there are now nine cases in the total of fifty-two, eight of them in the second series of twenty-three cases. Had the patients of the first series been equally followed up, there can be no reasonable doubt that the percentage of successful cases would be very considerable.

With regard to recurrence or metastasis the number of cases appears to me too small. Only two are actually recorded in which recurrence or metastasis is said to have taken place. But there are four other cases in which the patient died within a few months, and it is probable that the death of two or more of these patients was due to metastasis. The two cases in which it was known to have taken place were one of a round-celled sarcoma of the upper end of the tibia, for which amputation of the thigh was practised. The disease rapidly recurred and the patient died eleven months after the operation. The other was of a round-celled sarcoma of the middle and upper part of the fibula, for which resection of the affected portion of the bone was performed: rapid recurrence was treated by amputation by Gritti's method, and three months later the patient died of metastasis in the lungs.

The nine successful cases comprise five giant-celled tumours, three round-celled, and one spindle-celled. With the exception of one of the giant-celled tumours, the disease was, in every instance, of the upper epiphysis of the tibia, so that it was not favourably placed for amputation low down. In that case the affected portion of the bone was resected, and the patient was well five years later. Another myeloid tumour was cured by a scooping operation, for the patient was well eight years after it had been performed. Another case of myeloid disease was treated by scooping-out; but it recurred and the thigh was amputated two years later, nine years after which the patient was alive and well. In all the other successful cases amputation was performed, either through the thigh or at the knee, and the periods during which the patients were well afterwards were three years, five and a half years, five years, and more than eight years (three cases).

Comparing the results, then, of the first series of twenty-nine cases and the second series of twenty-three cases, there were nine deaths and one cure in the first series against no deaths and eight cures in the second series.

Nor is this all. In the first series of cases there were no resection operations, and no case of scooping-out in which the operation had been followed by any measure of success. Indeed, both the cases of scooping-out had been later treated by amputation through the thigh. Now I have to record four cases of resection, two of which were practised by Morton (of Bristol) for myeloid disease (*British Medical Journal*, 1898, ii. 228). The knee-joint was resected in each case, with a good result so far as the later use of the limb was concerned. The total results of the four cases were that the three patients suffering from myeloid disease were well eight months, nearly twelve months, and five years respectively after the operation. The fourth case has already been alluded to, in which resection of a portion of the fibula for round-celled sarcoma was followed by local recurrence, amputation through the thigh, and death three months later from metastasis in the lungs. Scooping-out and "removal," which probably means much the same thing, were practised in ten cases, three in the first, and seven in the second series. One of the patients was well fifteen months later, two patients two years later, and one eight years later. One patient was lost sight of after recovery from the

operation, and in the remaining five cases amputation was resorted to on account of recurrence of the disease. In all the most successful of these cases the disease was giant-celled. Several of the amputations for recurrent disease were very successful. One of the patients, whose case is recorded by Mr. Colby and myself, was well nine years after the amputation.

Conclusions.—Although it is well still to speak with reserve on the possibilities of operations for central sarcoma of the bones of the leg, I think we are justified in concluding that giant-celled (myeloid) tumours may occasionally be successfully treated by scooping-out from the cavity in which they lie. Such tumours may be more often treated with success by resection of the affected portion of the bone. For the large majority of central tumours, in the present condition of diagnosis, amputation through the lower part of the thigh or at the knee must be performed.

The prognosis is absolutely good for well-marked giant-celled tumours, and is by no means bad for other varieties of sarcoma. It is possible that the relation of the tumour to the surrounding soft parts may have a good deal to do with the prognosis of the course it is likely to pursue, but there is little evidence on this point at present. It seems only reasonable to expect that a tumour which has broken through its bony shell and involved the surrounding soft parts will be more likely to recur and become disseminated than a tumour which is still confined within the interior of the bone. Later investigations will probably solve this point.

CHAPTER IV

LYMPHATIC GLANDS

It is exceedingly difficult, at the present moment, to write a chapter on the surgical treatment of malignant disease of the lymphatic glands on account of the confusion which prevails in relation to the whole subject. It is certain that several names are employed to designate the same disease; I believe it to be equally certain that more than one disease is included under the same name. The diagnosis between some of the forms of malignant disease and tubercle of the lymphatic gland is so difficult that, even in the dead-house, and after microscopical examination and inoculation experiments, doubt may still exist on the real nature of the disease. Malignant disease and tubercle seem sometimes to attack the lymphatic glands at or about the same time. At this present moment, however, surgeons and pathologists are at work on the malignant affections of the glands, and it is to be sincerely hoped that, owing to their combined efforts, order may be evolved out of the existing chaos. In the meantime I will deal with the subject as far as lies in my power.

Occasionally, accounts are given of primary carcinoma of the lymphatic glands, but it is probable that in the large majority of such cases the primary disease has been overlooked. Endothelioma may, however, occur as a primary disease, and the structure of the tumour may so closely resemble that of carcinoma that the two diseases may be confounded.

I have never met with primary spindle-celled sarcoma of the glands, and I imagine it is of very infrequent occurrence.

In this country we speak of primary malignant disease of the lymphatic glands under the name of Lymphadenoma or Hodgkin's disease, and of the more rapid cases, especially those which are associated with metastatic growths, under the name of Lympho-sarcoma; but we have not established a

decided distinction between the two diseases. In Germany a clinical difference has been established, and is generally accepted. The tumours which break through the capsule of the gland, grow into the surrounding structures, exhibit an inclination to adhesions, ulceration, sanious discharge, and form completely heteroplastic metastases, are regarded as sarcomata of the lymphatic glands. The tumours which arise, for the most part, in a group of glands, and gradually spread to the neighbouring groups, rarely becoming generalised, which produce swelling of the glands without breaking through the capsule, and which form peri-adenitic adhesions without inclination to regressive metamorphoses and ulceration, which produce metastases which are limited to the lymphatic organs or to the formation of lymphatic nodules, similar to those of leucæmia, are regarded as cases of malignant lymphoma. (Dietrich, *Beitr. z. klin. Chir.* xiv. 377, 1896).

From the surgical view it seems to matter little what name is given to the disease, for it presents itself, almost always, in the form of a tumour which is composed of several or many glands, and which has already affected glands at some distance, although they are not noticeably enlarged. The glands of the neck are those in which the disease most frequently begins. The diseased glands may remain separate from one another, either throughout the course of the disease, or may become adherent to one another and to the surrounding structures. As there are seldom signs of inflammation in or around the tumours, the close connection with the surrounding structures is apt to be overlooked, and only to be discovered during an attempt to remove the disease. The disease may extend from group to group of neighbouring glands, or may attack glands at a considerable distance. The spleen may become enlarged, and secondary disease may occur in the bones, skin, intestines, and many organs and tissues of the body.

The large masses of glands seldom suppurate or slough, but I have seen both these accidents. They seldom become caseous; but they may do so without the association with tubercle, which has been noticed. Death usually takes place from some intercurrent disease, pneumonia, peritonitis, disease of the kidneys, &c., or the patient may become more and more debilitated, and at length die exhausted.

In the later stages of the disease an increase of colourless

corpuscles may be observed in the blood, but there is no true leucæmia.

Little is known of the etiology of the glandular diseases which are grouped together under the name of lymphadenoma or lympho-sarcoma. Males are more subject to them than females, and they are more common in childhood and middle adult age than at other periods of life, although no age is immune from their occurrence.

Methods of Operation.—The only operative treatment which is suitable is removal of the diseased glands with the knife. It is not possible to lay down detailed directions with regard to the incisions which should be practised in the individual case. Suffice it to say that they should be as far as possible in the long axis of the body, and should be so free as to afford a very complete exposure of the whole of the disease. Single incisions, however long, seldom suffice, and they must be supplemented by oblique incisions, and, if absolutely necessary, by transverse incisions. The dissection must be carried close to the enlarged glands, which should be shelled out rather than cut out. By this means the hæmorrhage is reduced considerably. But if the surrounding structures are adherent, they must be as freely removed as is possible from the important structures in the midst of which they lie. The operation may be aseptic or antiseptic, according to the preference of the operator. And care should be taken after it is over to maintain rest of the part from which the glands have been removed.

Results of Operation.—I do not know of any instance in which a permanent cure has been effected by the removal of undoubted primary disease of the lymphatic glands. I have on several occasions removed large masses of them and have seen them removed by my colleagues, but the operation is generally regarded as, at the best, but palliative. Nor is this much to be wondered at. When malignant disease of other organs and tissues has invaded the lymphatic glands the prospect of cure by operation is very largely diminished, for it usually spreads rapidly from gland to gland. When it commences in the lymphatic glands, its progress from gland to gland is generally more rapid than that of secondary disease. Indeed, in the very large majority of cases, an entire group of glands seems to be affected simultaneously. Whether this be

so or not, the patient seldom consults a surgeon until there is an enlargement of a group of glands. Even then the diagnosis of the case is often so difficult that there may be the greatest doubt whether the case is one of tubercle or of malignant disease. If one of the glands is removed it may be possible to make a diagnosis by microscopical examination. In some cases, however, this does not suffice, and inoculation of animals must be resorted to in order to be sure the case is not one of tubercle.

I believe my own experience in these matters reflects that of most surgeons and pathologists. It is too early yet to say that surgery is powerless against primary malignant disease of the lymphatic glands. We are too ill-informed at present to be able to speak with confidence on what constitutes primary malignant disease of the lymphatic glands; what relation it bears to the tumour-diseases of other parts of the body; what relation it has with tubercle and the infective diseases. I had thought it was amenable, to some extent, to arsenic and, in the last edition, recommended arsenic against the developed disease in place of operation. From researches I have for some time past been making in conjunction with Dr. F. W. Andrewes, I am now not sure of that.

CHAPTER V

SPLEEN

From time to time accounts have been published of primary "cancer" of the spleen, but the actual disease has been round-celled or lympho-sarcoma in nearly every instance in which a microscopical examination has been made. The tumour may become adherent to the neighbouring organs and affect the lymphatic glands in front of the vertebral column. Of the occurrence of secondary tumours in other parts of the body it is difficult to speak certainly, but there is at least one case on record to prove that many secondary tumours may be formed. The disease appears to attack adults, and to be of extremely rare occurrence in them, to present no certain signs by which it can be recognised as malignant disease, or even as a disease of the spleen. Under these circumstances it is not to be wondered at that there are very few cases on record, even in this period of surgical activity, of removal of a primary cancer of the spleen.

The first instance of which I am aware of the removal of a "cancerous" spleen is that which was related by Von Hacker before the Deutsche Gesellschaft für Chirurgie in 1884. The spleen was removed by Billroth by median laparotomy from the abdomen of a woman forty-three years old. She had been aware of the presence of a tumour for about seven years: during the last two years it had grown much more quickly, and during the last seven months had become movable in the abdomen. When the tumour was exposed it was found to be adherent to the omentum, the small intestine, and the tail of the pancreas. In order completely to remove it the end of the pancreas was cut off with a heated wire. The patient made a good recovery. But Von Hacker stated at the next meeting of the Society that the woman had died of recurrence of the disease in the course of a few months. The operation

was performed on March 20, 1884, and the patient died in the autumn of the same year.

Since Billroth's operation the spleen has been removed in seven or eight instances for malignant disease. Vanverts, in an excellent monograph ("De la Splénéctomie," Thèse de Paris, 1897), has collected 280 cases of removal of the spleen for various disorders. Amongst these there are eight cases, including that in which Billroth performed the operation, in which splenectomy was performed for malignant disease, seven times for sarcoma, and once for "epithelioma primitif." Three of the patients died of the operation, and five recovered. It is worthy of note that all the patients in whom the spleen was movable at the time of the operation recovered, while three of the four patients in whom the spleen was fixed died. Of the five patients who survived, one was stated to be very ill three months later; one died in the course of about six months of recurrence of the disease, and the remaining three were alive and well at periods of seven months, two years, and four years.

The diagnosis of primary malignant disease of the spleen is exceedingly difficult. It is therefore probable that a malignant spleen will be removed from time to time, under the impression that the operator is dealing with a simple enlargement or with a movable and troublesome organ. The best cases are, undoubtedly, those in which the spleen is movable, both in regard to the immediate and the remote results. The operation has been, almost without exception, fatal when it has been performed for the removal of the spleen from persons suffering from leucocythemia.

CHAPTER VI

BRAIN

THE brain is rarely, if ever, the seat of primary carcinoma, but is subject to sarcoma and glioma (which may perhaps be regarded as a variety of sarcoma). The tumour may originate in almost any part of the interior of the skull, from the membranes of the brain, from the cerebrum, the cerebellum, the pons, medulla, or the crura; and in connection with the grey or white matter. Some of the tumours are circumscribed, encapsuled, and more or less easily detached from the part from which they grow; but, in the majority of instances, they are diffused, and not only not easily separable from the brain substance, but not even always easily distinguished from it. They vary much in consistence and form, and are for the most part very soft and vascular. They are in most cases single, but sometimes two or more tumours are found in different parts of the same brain. Of their rate of growth it is not very easy to form a just estimate, for some of them appear to have existed a long time without producing other than trivial symptoms, or perhaps no symptoms of intra-cranial tumour, while the symptoms of others of them are so confused with those of associated brain disease that they cannot certainly be separated. The cause of death is very variable; it may be due to the slow and steady progress of the tumour, or to intra-cranial inflammation, or to the effusion of fluid into the ventricles. Or some intercurrent disease, such as pneumonia, may prove fatal. Affection of the lymphatic glands of the neck does not occur, unless as a very rare accident. Nor is it usual to find secondary growths in other organs and tissues. Indeed, were it not for the anatomical structure of the tumours and their diffuse growth, which tends to incorporate the neighbouring structures, there might exist a reasonable doubt of the actual malignancy of these tumours of the brain They kill,

no doubt, but by reason of their situation, not by producing general sarcomatosis. I have been much struck, I confess, with these features of intra-cranial malignant tumours, and have been more than once inclined to question their malignancy. But I believe they are malignant, not only on account of the two characters which have been mentioned, but because they are sometimes associated with secondary growths. And further, it must be recognised that death ensues in many instances at an early period of the disease, long before the tumour-affection can be said to have reached its full development. Were sufficient time accorded, there can be little doubt that many of the intra-cranial tumours would be associated with similar growths in the lungs, the liver, and other organs.

Like all other malignant diseases, intra-cranial tumours are much more common in adults than in children, but their occurrence is by no means limited to adults.

The question of the removal of a tumour from the interior of the skull could scarcely have been seriously considered, however great the advance in operative surgery, were it not for the simultaneous advance in the diagnosis of intra-cranial disease which we owe in large part to Ferrier and Hughlings Jackson. There can be little doubt, also, that vivisection experiments have shown how much the brain will bear at the hands of operators, and how quickly and easily wounds of the brain which are made with care and rigidly treated will recover.

Twelve years ago the surgery of tumours of the brain was purely experimental, and I thought that the removal of malignant tumours would never become a recognised practice, even among skilled surgeons. Although since that time a number of malignant tumours have been removed, the prospect of the future is anything but encouraging. The whole question, as it affects malignant tumours, is a very difficult one, hence the confused mingling, under the common name of "tumour," of many diseases which differ widely from each other in origin, nature, course, and general pathology. In what other part of the body, for example, would tuberculous and gummatous masses be considered with sarcomata in their relation to surgery? In the surgery of the brain, however, they have this in common that, if they are progressive, they produce similar symptoms; and there is often no means of forming a diagnosis between innocent and malignant tumours,

or even between true new-growths and tumours which are not new growths. It is interesting to observe that surgeons of large experience in brain-surgery of all kinds—for example, Von Bergmann—appear to grow less hopeful of the future of the surgery of tumours of the brain (*Centralbl. f. Chir.* xxiv. 1044, 1897), while some of the physicians, such as Professor Allen Starr of New York (*British Medical Journal*, 1897, ii. 1047) speak with growing hope of what will yet be done. I can understand hope on the one hand and despair on the other, but I confess I find it difficult to understand the enthusiastic language in which the optimists speak of the brilliant success which has attended the surgery of tumours of the brain thus far. The very bases on which better results are to be procured are, in some respects, still wanting. The diagnosis of suitable tumours in an early stage is often not merely difficult, but, in in our present state of knowledge, absolutely impossible. Some of the very best cases for operation are discovered, sometimes quite unexpectedly, at the post-mortem examination of patients who have presented no symptom of affection of the brain during life. There are generally few indications of the size of the tumour, and its relation to the surrounding substance of the brain is only discovered at the time of the operation. I suppose the effect of a fruitless operation, where no tumour has been discovered after the greatest care in diagnosis by the surgeon, or by the surgeon in consultation with the neurologist, is far more depressing on the surgeon than on the physician, particularly as the former knows full well that large exploratory operations on the brain are not infrequently followed by an addition to the troubles from which the patient suffered before them; so many of these unsuccessful explorations have been recorded, to say nothing of many cases in which the tumour has been discovered but has been found to be unsuitable for removal. And it is quite certain that many more of these fruitless operations have not been publicly recorded, so that the successes must be very largely discounted by comparing them with the mortality due to the operation, and with the great number of cases in which the operation, for one or another cause, has not been completed. Professor Starr's frame of mind interests me very much in relation to one side of the subject. In his very excellent paper he has collected from several sources 1161 reports of tumours of the brain of all

kinds, new-growths and others, and has found that the recorders and collectors of the cases have set down eighty-eight of them as operable, on which he comments: "Eighty-eight tumours out of 1161 might have been successfully diagnosticated and removed—seven per cent." I think the surgeons would express the condition differently, and say: "Eighty-eight tumours out of 1161 might have been removed *if they could have been successfully diagnosticated.*" The difficulty of diagnosis and of localising the disease is strikingly exhibited in the fifteen cases in which so distinguished a specialist as Dr. Starr recommended an operation, and in which it was carried out, so to speak, under his direction. In nine of them the tumour was found where it had been diagnosed, and in eight of the nine it was removed. In six it was not found; five of these cases were of tumour of the cerebellum, and the necropsy showed the tumours to have been inaccessible, as they lay on the anterior surface far from the bone. The remaining tumour was found after death deep in the apex of the temporal lobe and Island of Reil.

Mr. Horsley, in 1887, criticising Dr. Hale White's deductions drawn from the post-mortem records of one hundred tumours of the brain, said: "For the full advantage to be gained from operative procedure it is obvious that the disease must be attacked in an early stage." Unfortunately, a large part of the difficulty lies, not merely in establishing an early diagnosis, but even, in a goodly number of cases, in diagnosing the existence of a tumour.

Methods of Operating—I am not aware of any recent additions to this part, or to any part, of the subject by our most successful English operator; but I will take Mr. Horsley's directions on the manner of performing the operation as they were published years ago, and will supplement them with later suggestions (*British Medical Journal*, 1887, i. 863).

In the first place, the administration of morphine is recommended previous to the administration of chloroform, but the author points out that the chloroform must be administered very cautiously on account of the startling rapidity with which a patient who has roused up in the middle of the operation is sent off again in a moment with only a few whiffs of the drug. Further, the remarkable "proclivity" of children to the effect of morphine must be properly discounted.

The scalp-flap, instead of being crucial, should be semilunar and large, so outlined as to preserve in its attachment either the superficial temporal or occipital arteries uninjured, and should include the pericranium in its thickness. It is very important that the pericranium should not be separately raised up off the bone.

The bone is treated by first removing an inch disc with the trephine, and then cutting out a piece of the size required with a circular saw mounted on Bonwill's surgical engine. The separation is completed with very powerful bone-forceps. The fragments of bone removed may be replaced on the conclusion of the operation in cases in which it has been possible to preserve the dura mater, and may be included with good result between this membrane and the scalp-flap.

If the dura mater is not involved in the disease none of it need be removed, but in cases in which it is affected the diseased portions must be freely excised. When the implication of the membrane is recent and slight, nothing is noticed but an increase of its vascularity; but when the affection is more advanced it is yellowish or even dirty red in colour. The incision is made in the dura mater with a scalpel and increased, as far as may be needed, with blunt-pointed scissors. The vessels are ligatured as they are reached, and, if possible, before they are divided.

The brain may be freely incised and as much of it as necessary removed to expose and remove the tumour. Hæmorrhage is guarded against, first, by the administration of morphine before the inhalation of the chloroform; second, by raising with great care the pia mater from its surface and from between its sulci; third, by always making the incisions in its substance exactly vertical to its surface. The operator need not hesitate to remove even a wide area of the brain-substance in the vicinity of a malignant tumour, just as he would do in the removal of a malignant tumour of the superficial parts of the body. If hæmorrhage occurs during the operation, it may be arrested by plugging the wound for a few minutes with a fragment of sponge or gauze.

When the disease has been removed and all oozing has ceased, the flap is laid down in place and its edges are united by sutures placed at frequent intervals. A drainage-tube is inserted at the most dependent point as the patient lies in the

recumbent posture. The tube is left in for twenty-four hours and is then removed, unless there is such extreme tension as to render it expedient to retain it, or even to introduce a probe beneath the flap in order to let out the fluid which may have collected there. So far, however, from removing this fluid, and relieving the tension which almost invariably exists to a limited extent, Mr. Horsley considers that the presence of the fluid is desirable, in order to maintain a certain degree of pressure, so that protrusion of a hernia cerebri may be prevented.

Union is expected to take place by the first intention, and the patient may be out of bed at the end of ten days, if all goes well.

Starr, who has watched fifteen operations, prefers to all others the flap operation of Wagner (*Centralbl. f. Chir.* xviii. 25, 1891), in which a horseshoe-shaped incision is chiselled through the bone, scalp and bone being reflected together, thus exposing a very large surface of the brain at the outset. The bone is chiselled through, not vertically, but at an angle of about forty-five degrees to its surface. Starr recommends that, in prising up the bony flap, pressure should be exerted at three points.

For the more rapid elevation of a portion of bone or of a flap consisting of the scalp and bone various mechanical appliances are used, of which Doyen's appear to be some of the best. They consist of borers and saws worked by electricity. By a combination of boring and sawing the dura mater may be laid bare in the course of a very few minutes (*Deutsche Gesellschaft f. Chir.* xxvii. *Bericht S.* 66).

Again, if the exposure of the dura mater has been long and severe, the operation may be divided into two parts, the second part being performed a few days after the first.

It need scarcely be insisted on that the scalp should be very carefully prepared before the operation in order to avoid sepsis. It requires more active scrubbing than the surface of most other parts of the body; but the same routine may be adopted as for operation on the breast and axilla. (See chapter on the Breast).

Results of Operations.—*Mortality due to the Operation.*—Even on this point it is not easy to speak with precision. Starr has put together the largest number of operations with which I am acquainted—220 for the removal of tumours of

different kinds. Instead of giving the total mortality, he has only given the mortality of the 140 cases in which a tumour was found and *removed*. It amounted to forty-eight, which Starr calls a mortality of thirty per cent. I make it thirty-four per cent. In 120 of the cases the nature of the disease is stated, and in sixty-five of the 120 it was sarcoma, glioma, or glio-sarcoma. Of these sixty-five, twenty-two were fatal, so that the mortality is much the same for the completed removals of malignant tumour as for all kinds of tumour.

The causes of death, according to Starr, were: "Shock (which is now prevented by dividing the operation into two stages on different days), or to hæmorrhage (the arrest of which is less difficult than formerly, because of many ingenious devices), or to sepsis (which can now be obviated)." Von Bergmann, describing his latest experience, at the Moscow Congress in 1897 (*Centralbl. f. Chir.* 1897, xxiv. 1044), speaks of sepsis and hæmorrhage (at the time of the operation) as preventible dangers; but sets down shock, post-operation epilepsy, prolapse of the brain, and post-operation hemiplegia as the great causes of death after operation. With regard to the arrest of hæmorrhage during the operation, the larger vessels should at once be tied, and pressure should be exerted on those which cannot be tied either with the finger or with sterilised gauze, or an aseptic wax should be used. Von Bramann (*Deutsche Gesellschaft f. Chir.* xxi. 519, 1892) strongly recommends that pressure by means of sterilised gauze should be maintained on the surface of the brain as far as possible during the performance of the operation, not only in order to stay the bleeding, but also to prevent œdema of the brain, which is much dreaded. He is sure this can be avoided by a tampon of iodoform gauze and sterilised gauze after the removal of the tumour.

Cures effected by Operation.—Up to the present time the efforts of surgeons have been so directed to the question of the possibility of the removal of tumours of the brain, and to the best means of combating the dangers of the operation, that no one seems to have taken the pains to follow up the cases in which the removal of a malignant tumour has been performed. In a few cases the patient is reported as being still free from signs of recurrence at the end of several months, but I do not know whether there are any instances of perfectly good health

more than three years after the operation. No doubt, in the next few years more information will be forthcoming of the future of such cases.

In the face of a very large mortality from the operation, and of various troubles which may be set up by the operation itself, and the absence of definite information of anything like complete cures effected by operation, we are scarcely justified in holding a cheerful view of the future of the operative surgery of malignant disease of the brain. Still, operations will almost certainly continue to be performed, the more certainly because the diagnosis of one kind of tumour from another is often so difficult as to be impossible. But surgeons will probably prefer in future to direct their efforts to the removal of tumours of the central convolutions (the ascending frontal and the ascending parietal) in accordance with Von Bergmann's recommendation. And the diagnosis of a tumour in this situation should be very clear if an operation is to be undertaken with any reasonable prospect of success. As a rule, the diffused tumours should not be attacked when their diffuse character has been discovered.

CHAPTER VII

THE EYE

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In this chapter I propose to restrict my remarks to intra-ocular tumours, and only so far to speak of epibulbar tumours as they are distinctly of intra-ocular origin.

Two distinct forms of malignant tumour originate in the interior of the eye—namely, glioma of the retina and sarcoma of the uveal tract (choroid, ciliary body, and iris). Glioma has till lately been included under the sarcomata, but it differs much from them, and is now, probably, best considered as a carcinoma (neuro-epithelioma). Clinically, glioma and sarcoma of the eye pursue so different a course that it is necessary to study them separately in order to arrive at a correct conclusion with regard to the character of the operation which should be performed, and the probable chances of a successful issue.

Glioma of the retina is usually in its origin a circumscribed tumour, but may be diffuse, and grows from the neuroglial tissue anywhere between the external and internal limiting membranes. It generally tends to grow outwards (glioma exophytum), but may spread inwards (glioma endophytum). It occurs almost invariably in children, and only six cases are recorded over twelve years of age, the oldest being seventeen years. It is usually found under the age of two years and may be present at birth. It is either white or pinkish-white in colour and can generally be distinguished at an early period with the ophthalmoscope.

Microscopically, the cells in glioma are of embryonic type, chiefly small and round in shape, some are star-shaped with offsets like neuroglial cells. There is a great tendency to degeneration; fatty and calcareous changes are generally present.

The course of the disease may be divided clinically into three stages, and it is very important, as far as prognosis and treatment are concerned, that these should be recognised and determined. The first, or non-irritative, stage is commonly known as the "cat's-eye" stage from the peculiar white reflection seen in the pupillary aperture. The second, irritative or glaucomatous, stage is reached when, owing to the growth of the tumour, the eye becomes inflamed, and in a state of increased tension. The third, or extra-ocular, stage is that in which the tumour has escaped from the eyeball, either along the optic nerve or by perforation of the cornea or sclerotic. The growth then produces a fungous mass which may fill the orbit and extend beyond it into the surrounding structures. In consequence of its early exit from the globe by way of the optic nerve, and of its great tendency to follow the course of the nerve, glioma may creep through the optic foramen into the cavity of the cranium, where it may form a large mass in the vicinity of the optic chiasma, or may affect the membranes of the brain and extend to the medulla, and even to the spinal cord, before it causes death. The implication of the optic nerve, in my opinion, should be included in the third stage; the nerve itself is first affected by extension of the growth, and then the sheath, as shown by great thickening of the nerves.

The stages of the disease cannot always be accurately defined, but as a rule the first stage lasts from six months to a year, the second stage from a few weeks to eighteen months, and the third stage from three to four months.

In many cases—about twenty per cent.—the two eyes are simultaneously or nearly simultaneously affected, and in some cases, not only is there no evidence, microscopical or other, of affection of the nerves between the two eyes, but the nerves have been found to be actually atrophied. The assumption, therefore, is that in this class of cases the tumours are due to the same cause and are of equal standing, just as in some instances both breasts are simultaneously attacked by carcinoma. The progress of the disease varies in different cases within certain limits. The bones of the skull may become the seat of numerous tumours, either by direct continuity or perhaps through the vessels of the diploë The lymphatic glands in front of the ear, behind the jaw, and in the neck are not infrequently affected. Secondary deposits are occasionally found

in the liver and other parts of the body, but this is an exception to the general rule, and is one of the greatest differences between glioma and sarcoma, as in the latter disease metastasis is common. Death usually ensues from meningitis or other cerebral complications owing to continuation of the growth from the orbit, but, in other cases, it may be due to general marasmus or septicæmia.

Sarcoma may originate in any part of the uveal tract, but is much more common in the choroid than elsewhere. It may be pigmented or uncoloured, spindle- or round-celled. The pigmented or melanotic sarcomata are more numerous than those which contain no pigment. The first respect in which sarcoma differs from glioma is in its relation to age, for although it may occasionally occur during childhood, it is nearly invariably met with in adults, and the cases become more numerous in proportion to the age of the patient, the greater number being between thirty and fifty years of age. It never affects both eyes.

The tumour itself has a tendency to fill the globe, and sometimes it does so quickly, but in other cases the growth is very slow, so that many years may elapse before the eyeball is filled and its fibrous tunic perforated.

Four stages of the disease are generally described. First, the non-irritative; second, the irritative or glaucomatous; third, the extra-ocular, and fourth, the metastatic. It will be seen that the first three stages correspond to those of glioma.

If the disease be not treated surgically, it generally passes through these four stages, but if the eye be removed during any of the stages, the usual recurrence is in the form of metastasis (fourth stage).

In the third stage perforation does not take place at or in connection with the optic nerve entrance. After perforation the orbit becomes as a rule affected and is sometimes the seat of numerous small nodules which are separated from each other by what appears to the naked eye to be a distinct interval of connective tissue. From these nodules other similar nodules may form in the periosteum and bones of the orbit, and may extend into the brain, but growths in the brain are not common. The lymphatic glands are not so often affected as they are in many cases of glioma, although in the generalisation of the disease some of the distant glands may, like

other organs, be the seat of secondary affection. On the other hand, metastasis is far more frequent than in the case of glioma, the liver especially affording a nidus for the secondary growths, which may occur also in the stomach, skin, heart, kidneys, bones, lungs, and other parts. Dissemination of the disease is so common and occurs so early that the removal of the eye in the first stage, even when the tumour is quite small and of apparently recent occurrence, is, more often than not, futile as a means of saving the life of the patient. The number of instances in which no operation is performed is so small that it is difficult to arrive at a correct conclusion regarding the natural duration of the disease, but it is probably longer than that of glioma if a large number of cases of each disease be compared.

Methods of Operation.—*Iridectomy.*—In those cases of sarcoma in which the tumour is very small and distinctly limited to the iris it may be removed by an iridectomy, performed in the ordinary manner, care being taken to remove not only the tumour, but a sufficient area of the surrounding normal tissues of the iris.

Enucleation.—The patient being under the influence of a general anæsthetic, the lids are widely separated by the speculum. The conjunctiva is divided with a curved pair of scissors as close as possible to the corneal margin; the rectus tendon which lies to the right side of the operator (external rectus of the right eye, internal rectus of the left eye) is raised on a strabismus hook and divided with the scissors on the orbital side of the hook. The three other recti are then in turn divided between the hook and the eyeball. The eye is now fixed by holding, with fixation forceps, the rectus tendon which is first cut, and the globe being pulled forward, the optic nerve is divided by the scissors as far back as possible. Too much stress cannot be laid on this division of the nerve, and in no case of enucleation for glioma ought the operator to be content with a length of nerve less than six millimetres. The two oblique muscles are now divided with any tissue adhering to the eye, which is now free and can be removed. After removal of the eyeball, the optic nerve, cornea, sclerotic, and orbit should be most carefully examined for signs of new growth. If the nerve be thickened or altered in appearance, the stump should be sought for with a pair of forceps and divided as far back as

possible with a pair of blunt-pointed scissors, an operation not easy to do and generally called *resection of the optic nerve.* My own opinion is that in such cases the orbit should be directly exenterated, as also in those cases in which suspicious changes are found in the orbit after enucleation. In this operation it is very rarely necessary to ligature a vessel, the hæmorrhage ceases speedily after the application of cold water allowed to fall in a gentle stream from a sponge held above the wound. The lids are now closed and a dressing of antiseptic cotton-wool is placed upon them. A bandage is applied so as to maintain sufficient pressure to arrest hæmorrhage from the small vessels and capillaries. Recovery is very rapid.

Exenteration of the Orbit.—When the patient is thoroughly under the influence of a general anæsthetic, the external commissure of the eye is split as far as or beyond the margin of the orbit when the lids can be turned back (the upper above and the lower below) and raised off the tumour or eyeball. The tissues between the everted lids are then divided down to the bony margin of the orbit. The growth or contents of the orbit are now seized with the vulsellum forceps and separated from the walls of the orbit with the aid of a blunt elevator, commencing along the outer wall. This can be done without difficulty when the tumour is not adherent to the sides of the orbit. The separation is performed all round until the optic nerve and the attachments of the muscles at the back are reached, when they are all divided with a strong pair of slightly curved scissors.

If the periosteum is adherent to the tumour and it is considered expedient to remove it, it must be incised at the margin of the orbit, where it adheres firmly to the bone, with a sharp scalpel, after which it is raised from the bone in the same manner as the contents of the orbit were separated, and is removed either in whole or part. If the lids are affected, they must be removed by two semicircular incisions along the line of the orbital margins.

The hæmorrhage caused by the operation is seldom serious and can usually be easily stayed by the application of cold water in the manner described in the paragraph on enucleation. As a rule, it is necessary to plug the orbit with long strips of cyanide gauze, or, if there is much tendency to bleed, to apply lint soaked in the tincture of the perchloride of iron or in the

solution of the sub-sulphate. The amount of pressure which is exercised by the strips must depend on the tendency to hæmorrhage. The lids are closed, as in the last case, and the wound of the external commissure is brought together with two or three sutures, and a pad of cotton-wool is laid over them and kept in place with a bandage.

Caustics.—Even the most ardent advocates of caustics are not, so far as I am aware, in the habit of employing them for the destruction of eyes containing malignant tumours in their interior, although they have been used in certain cases in which the intra-ocular tumour has grown through the tunics of the eye and has become a fungous mass. Their use has, however, been almost restricted to the cases in which the disease has affected the deeper structures of the orbit, particularly the periosteum and bone. They are more frequently employed in operations for recurrent disease, and usually as an adjunct to removal of the disease by the scissors or the knife. In England caustics are employed for this purpose more often than in France or Germany, and the material which is in favour is chloride of zinc. One part of the chloride is mixed with four parts of meal, and with as much tincture of opium as the operator thinks desirable to allay the pain of the application, and is rubbed into a paste of the consistency of honey. This paste is spread on strips of linen, which are applied to the diseased parts.

The actual or galvano-cautery is sometimes applied for the same purpose. In the course of time, which may be as long as several weeks or even two or three months, the portions of bone exfoliate and come away.

Results of Operations.—*Mortality of the Operations.*—The danger of death after iridectomy for malignant tumours is so trivial that it need not be taken into account in considering the desirability of removal of the disease. The same may be said of simple enucleation of the eye: the operation is almost without danger to life, although occasionally a patient dies, as it were by accident, as he might do after the removal of the last phalanx of a finger or some similar operation.

Exenteration of the orbit is of course a more severe proceeding, and should not be undertaken lightly. It is, however, exceedingly difficult to form a correct estimate of the mortality which results from the operation, owing to the loose fashion in

which the term "extirpation" has been used. Many of the so-called extirpations are in reality exenterations, and many of the operations for recurrent disease within the orbit are exenterations. Taking fifty-three cases of extirpation, exenteration, and removal of recurrent tumours from the orbit—operations varying probably in extent, and some of them involving not only the removal of the contents of the orbit, but the application of caustic to the bony wall—four deaths are recorded. One of the patients died of apoplexy the day after the removal of a recurrent tumour, and the death therefore need scarcely be attributed to the operation, but may be regarded as accidental. The actual mortality would then stand at three in fifty-three cases, or about six per cent.—by no means a large mortality when the extensive nature of some of the operations is taken into account, and the close proximity of the cerebral membranes and the brain. The three deaths were due to hæmorrhage, to erysipelas, and to septicæmia.

Cure of the Disease by Operation.—In order to estimate the value of operations for the cure of malignant disease of the eye, it is necessary to consider operations for glioma and sarcoma separately.

Glioma.—A very complete monograph on glioma by Wintersteiner (*Das Neuro-epithelioma Retinæ*, 1897) has lately been published. It is the result of a study of 497 cases. Of these cases, fifty-seven were not submitted to operation, and of ninety-seven the further history was unknown. The author bases his percentages on the whole number of cases as follows:

Eighty-one patients were reported well and free from disease one year after operation; sixty-eight cases two years afterwards; and fifty-five cases three years afterwards. The percentages estimated on the 497 cases would give 16·3 per cent. of recoveries if one year be taken as the period of immunity; 13·7 per cent. if two years; and 11·06 if three years. I should, myself, estimate the percentage with regard to 333 cases, leaving out the cases not operated upon, those of which the after history was unknown, and those in which death ensued from other causes too soon to allow time for recurrence of the disease. This would work out as 24·3 per cent. of recoveries if one year be taken as the standard;

20·4 per cent. if two years; and 16·5 per cent. if three years.

It must be borne in mind that these percentages differ from one another so much owing to the fact that the cases have not been observed longer than the time stated and are not due to the patients having died in the interim. I should be disposed to think that the one-year estimate is the nearest to the true state of the case and that after the successful removal of the disease, the chances of recovery are about one to five. This result is very satisfactory, compared to the older statements, and nearly corresponds with Lukovic's five out of twenty-seven cases, and Lawford and Collins eight out of forty-six.

The better results now claimed are most probably due to the earlier detection of the disease.

The recurrence of the disease is much more rapid than in sarcoma, and takes place within one year of removal of the disease. A case of Vetsch is said to have had metastasis in the parotid gland three and a half years after enucleation, but doubt has been cast on it. Grolmann gives a case in which four years after excision of one eye, the second eye was affected. This may be explained by its being a distinct new growth and not a recurrence. The question whether glioma endophytum or exophytum is the more rapid in its course is as yet not settled.

Out of the 333 cases there were no less than 122 recurrences after operation, thirty-six occurred within four weeks, twenty-seven within two months, twenty-four within three months, ten within four months, and none over one year. It must be remembered that the exact date of the recurrence is frequently not given, as the notes of many cases describe the recurrent tumour as of considerable size.

It will be seen from these figures that there may be said to be little to fear from recurrence *in situ* if the patient is free from any sign of new growth three months after operation. The rapidity with which the disease extends from the interior of the eye along the optic nerve is the cause of this early recurrence, and the recurrent tumour is found, as might be expected, in and around the stump of the optic nerve. In spite of the liability of the lymphatic glands to become secondarily affected, there is much less liability to affection of distant parts of the body in connection with glioma than with

sarcoma of the eye: consequently, if the operation is successful in arresting the local extension of the tumour and there is no simultaneous affection of the other eye, complete cure may more reasonably be expected in cases of glioma than in cases of sarcoma.

Operations for recurrent disease are very rarely successful, but one case is on record in which exenteration was performed for recurrence taking place four weeks after enucleation and resection of the optic nerve, and the patient was alive four and a half years afterwards; another case of recurrence five weeks after exenteration was alive five years after the operation. There is therefore a slight hope that early and free removal of recurrent disease may be attended with success.

Wintersteiner gives the following statistics in a hundred cases in which recurrence took place: in seven cases operated on during the first stage the average interval of immunity was four months; in sixty-six operated on in the second stage it was 2·7 months; in twenty-seven operated on in the third stage the average was two months. These bear out the fact that the more advanced the growth, the quicker is the recurrence; the shortest known recurrence, was eight days and the longest twelve months, but these times are not necessarily the commencement of the recurrence as some growths are described as being as big as an orange even after only two and a half months.

The number of cases of metastasis after enucleation or exenteration is only thirteen, or four per cent., but this is probably too low, as in many cases the cause of death was not stated.

Sarcoma.—The great difficulty in estimating the percentage of recovery after operations for sarcoma is the fact that no cases can be called in any way cures until at least three years have passed by, and probably this period ought to be increased to four years or more. There are instances of metastasis and recurrence after eight years.

For the following statistics of results after operation in cases of sarcoma I am indebted to a great extent to the cases mentioned by the following authors. Fuchs (*Das Sarcom des Uvealtractus*, Vienna, 1882); Lawford and Collins (*Royal London Hospital Reports*, vol. xiii. p. 2, 1892); Groenouw (*Archiv für Ophthalmologie*, vol. xlvii. p. 398), and Hill Griffith (*Ophthalmic Review*, vol. x. p. 353).

Uveal Tract.—I have thought it best to give first the statistics for sarcoma of the whole uveal tract, as it is often difficult to distinguish the exact origin, and some authors do not attempt to give it.

The cases I have collected are 462, and of these 285 can count for our purpose. Of these, 145 were alive and without any signs of disease at some time after operation, and sixty-two of them more than three years after, giving 20·18 per cent. of more than probable recoveries. In fifty-four cases, or nineteen per cent., recurrence took place, and in ninety-three cases, or 32·6 per cent., metastasis; the number of patients dying from metastasis or recurrence being 116.

Since the time when Von Graefe stated that he had never known a case of sarcoma of the eye alive four years after operation the percentage of recoveries has steadily increased; a fact, no doubt, chiefly due to the disease being earlier recognised by the opthalmoscope. The percentage of recoveries in my collected cases, 20·18, is probably too low; Lawford and Collins in seventy-nine cases found 25·31 per cent. of recoveries, and Hirschberg twenty-five per cent. in eight cases. Hill Griffiths, fourteen recoveries in twenty-three cases, or 60·85 per cent.; this percentage is high because it does not include cases under four years' observation which other observers have been obliged to include.

If in my calculations only deaths and recoveries over three years were estimated, the percentage would at once be brought up to thirty-five.

Iris.—Primary sarcoma of the iris being the rarest, I have only been able to collect twelve cases of which the after history is known, and of these four (33·3 per cent.) were alive and sound more than three years after operation.

Seven of these were treated by iridectomy and two recurred quickly, one very soon after the operation when the eye was excised, one case was well nine years after, one three years, and the other three under eighteen months. Of five cases of enucleation, two were sound over three years after operation, one over two years, and the other two under one year. These results are very good, and I have been unable to trace a single instance in which death resulted amongst these cases, nor of recurrence after excision of an eye with sarcoma limited to the iris.

Ciliary Body.—The cases of sarcoma of the ciliary body are fifty-eight, and of these there are twenty-two in which enucleation was done and the after history known. In four cases (18·2 per cent.) there was recurrence, and one of them was peculiar from the recurrence taking place five years after the enucleation, the primary tumour being called a myoma. In seven cases (31·8 per cent.) there was metastasis and in the thirteen remaining sound cases, four (18·2 per cent.) were over three years' duration (two of these being five years) and the others under three years.

Choroid.—The cases of sarcoma of the choroid are by far the most numerous, and I have collected the following results from 330 published cases. Of these 218 are available for use, as they were all operated on, and information was in every case obtained for some time afterwards. Of the 218, 105 were alive and free from disease some time after the operation, but only forty-two were noted as alive three years and more, being 19·3 per cent. of notable recoveries; the longest interval recorded is fifteen years. One case, apparently cured, recurred in the orbit ten years after the operation, and patients have died from metastasis nine, seven, and five years after operation.

Ninety died with metastasis or were presumed on fair evidence to have done so. Thirty-nine were reported as having recurrent growth or growths in the orbit, of whom nine died of the recurrence and nine of metastasis. Of these recurrences a few deserve particular mention. In three cases the recurrences took place after a lapse of ten, nine, and seven years. In one case in which the recurrent growth was removed the patient was sound eight years after.

In discussing recurrent cases it must be remembered that some of the recurrences may have been submitted to operation after the report was made, and the fact of a second operation not recorded.

The results, therefore, of cases living more than three years after operation, in the special parts of the uveal tract, give 33·3 per cent. iris; 18·2 per cent. ciliary body; and 19·3 per cent. choroid. These results bear out the facts first drawn attention to by Fuchs. Firstly, with regard to the liability to local recurrence. Recurrence is scarcely to be feared if the disease is operated on while it is still confined within the eye, but the danger becomes considerable if the fibrous tunics of the

eye are perforated and the tumour has made its way into the surrounding tissues of the orbit. The period at which the recurrent tumour appears is generally within six months after the operation. Secondly, the proportion of cases in which generalisation took place in the first and second stages of the disease was almost as great as in the third, when the disease had extended into the structures of the orbit.

In comparing the statistics of glioma and sarcoma after operation we find great differences.

First, as to results: the percentage of cures after operation in glioma is about twenty-four, whereas in sarcoma it is 20·18 per cent. Recovery in sarcoma, even after three years, is not so certain, as several deaths have occurred after a longer interval, whereas only one case of recurrence of glioma has been recorded more than one year from operation.

In glioma the percentage of recoveries after operation depends on the duration and stage of the disease, whereas in sarcoma metastasis and consequent death may follow operations undertaken in the first stage nearly as frequently as in the later stages.

Recurrences are much more frequent in glioma than in sarcoma: 36·6 per cent. glioma and nineteen per cent. sarcoma, and they also occur much earlier in glioma.

Metastasis is rare in glioma compared to sarcoma, 32·6 per cent. in sarcoma and probably much higher; in glioma only about four per cent. Death, as a rule, results in glioma from the effects of direct spread of the disease, and in sarcoma from metastasis.

Conclusions.—First, in regard to Sarcomas.—Small and circumscribed sarcomas of the iris may be removed by the operation of iridectomy. If the disease recurs the eyeball should be enucleated.

Large sarcomas of the iris and sarcomas of the choroid and of the ciliary body should be treated as early as possible by removal of the eye. If the disease is in the first stage and therefore limited to the interior of the eye, and there is no perforation or appearance of perforation of the fibrous tunics, the prognosis is good so far as the prevention of recurrence is concerned, but only moderately good as to the cure of the disease on account of the very early period at which metastasis often occurs. Sarcomas which have escaped from the fibrous

tunics into the tissues of the orbit must be removed (by very free extirpation of the eye and the disease outside it, but better still) by exenteration of the orbit.

Recurrent disease should be freely removed by the same operation, and if the walls of the orbit are affected, it is well to treat them by the application of chloride of zinc. Even when there are distinct symptoms of metastasis, it may be expedient to remove the disease of the eye or orbit in order to prevent, if possible, the distressing protrusion and ulceration which occurs in the later stages.

Second, in regard to Glioma.—Glioma limited to a single eye should be removed as early as possible by enucleation of the eye, and the optic nerve should be divided as far back as possible with a pair of curved scissors. If there is any reason to suspect that the nerve is already affected it should be the rule to exenterate the orbit at once. Recurrent disease should be treated by exenteration.

If both eyes are affected, life can in many cases be saved by removal of them by enucleation or exenteration. Collins (*Transactions of Opthalmological Society*, vol. xvi. p. 142) has recorded four cases, in each of which three years have passed since the enucleation of the second eye, and the patients are alive, with no signs of recurrence. It is well in these cases to excise only one eye at a time, so as to ensure the diagnosis being a correct one.

Symptoms indicating the presence of a tumour in the interior of the skull contra-indicate any attempt to remove the disease within the orbit.

CHAPTER VIII

EXTERNAL EAR

A FEW rare instances of sarcoma of the outer ear have been recorded in surgical literature, but the disease is so rare that it need not be considered from an operative point of view.

The only variety of carcinoma which is comparatively frequent in this situation is the squamous-celled, or epithelioma; indeed, it is doubtful whether the ear is ever the seat of any of the other varieties, with the exception of rodent ulcer, which occurs from time to time, and which may, perhaps, be regarded as a form of epithelioma. Years ago I had never made a minute examination of a case of primary rodent ulcer of the external ear, nor had I ever met with an account of such an examination. Yet, I felt sure that the disease must attack the ear primarily from time to time; otherwise it was scarcely possible to reconcile the discrepancies which existed in the general descriptions of the course of cancer of the ear. I always looked on the case recorded by Mr. Bryant (*Medical Times and Gazette*, 1872, i. 2) as one of rodent ulcer. The patient was seventy-four years of age, a commander in the Navy; and the disease, which affected the whole of the pinna, had existed for at least eight years. There was not any affection of the lymphatic glands. The ear was amputated, no recurrence took place, and the patient was alive and well some years after the operation. At the Pathological Society, in 1894 (vol. xlv. p. 152) my colleague, Mr. Bowlby, gave an account of sixty-six cases of rodent ulcer, and in two of the sixty-six the external ear was the affected part. So that my supposition of the possible occurrence of primary rodent ulcer of the ear has been conclusively confirmed.

The ordinary epithelioma of the ear attacks men much more frequently than women, and is a disease not only of adult age, but of advanced adult age, occurring scarcely ever in persons

under forty years of age, and appearing much more frequently at a later period of life. The primary outbreak of the cancer may be at any part of the external ear, but more commonly affects the outer than the occipital aspect. This is what might be expected from the greater exposure of this surface. The influence of exposure in the production of the disease is further indicated by the fact that it is more frequent in men who follow occupations which expose them to the weather. In not a few instances the occurrence of the cancer has been preceded by long-standing eczema or other cutaneous affection. The cancer, commencing as a crack, a fissure, ulcer, or wart, soon ulcerates, spreads slowly over and into the substance of the pinna, and gradually destroys it. The cartilage resists the progress of the new growth, and is sometimes left projecting in the middle of the ulcer. From the pinna the disease may reach the adjacent portion of the scalp, or spread into the auditory meatus, and so reach the middle ear. The lymphatic glands behind and below the jaw are liable to become affected, when the prognosis becomes infinitely more grave. Of the occurrence of secondary growths in other parts of the body nothing can be said, for there is really no evidence before us; it probably rarely or never occurs. In the majority of cases the disease is by no means rapid in its course, and the shortest duration which I have yet found recorded, from the first appearance of the malignant ulcer to the death of the patient, is one year. In other instances the duration has been from one to two or three or more years, even when the cancer was the ordinary variety of squamous-celled carcinoma. The later stages are often associated with considerable radiating pain up the back and side of the head, with deep-seated ulceration of the ear and side of the head, and with enlargement and ulceration of the lymphatic glands.

The course of the malignant ulcers which are probably "rodent" is marked by a much slower progress and destruction of the ear, and by absence of affection of the lymphatic glands.

Methods of Operation.—Cancer of the ear has been removed by many different methods. It has been destroyed by means of caustics; removed with scissors, knife, écraseur, galvano-cautery loop; scraped away thoroughly with a sharp spoon, and the raw surface treated with caustics. But by far

the largest number of operations appear to have been performed with the knife. The operation, too, has varied from the mere removal of a small portion of the external ear to the complete cutting off the ear, the removal of a larger or smaller area of the surrounding integument, and the dissection of the lymphatic glands.

The mere removal of a small portion of the ear such as the lobe or a part of the helix, does not require a description ; nor is it necessary to describe the larger operations, which include the removal of the whole ear and perhaps of some of the adjacent integument. They are simply incisions, followed by insignificant hæmorrhage, and, in the majority of instances, by no serious symptoms. Many of the patients are, however, very old, and it is desirable to spare them, as far as possible, loss of blood. Before the operation every care should be taken to cleanse the ear and the surrounding parts, and, to ensure that the operation is aseptic or antiseptic, the scalp should be shaved for some distance around the ear ; and, if the central parts of the external ear are to be removed, the auditory meatus should be thoroughly cleaned when the patient is under the anæsthetic.

If it is determined to employ caustics I should recommend chloride of zinc or Vienna paste, to be used in the manner described in the chapter on the face. The same care must be given to absolute cleanliness in cases in which caustic is employed, as is given in cases of operation with a cutting instrument. For the use of caustics affords no guarantee against erysipelas, to which an aged and debilitated person, the very person on whom the destruction by caustics may be thought desirable, may fall a victim.

Results of Treatment. *Mortality due to the Operation.*— To the thirty-three cases which I collected with great difficulty (on account of the comparative rarity of the disease) for the last edition, I can add nine cases which have been treated by operation at St. Bartholomew's Hospital during the last eleven years, and four cases from Professor Kronlein's Klinik (Batzároff, "*Ueber die Malignen Tumoren des Gesichtes.*" Zürich, 1892.) There were two deaths in the first thirty-three cases, and there were no deaths in the subsequent thirteen, so that the mortality stands at two deaths in forty-six cases. Nearly all the patients were very old. The average age of Kronlein's

four patients was 68·6, and one of the patients who died of the operation (of erysipelas) was between ninety and one hundred years. In the other fatal case, the whole of the external ear was removed and the patient died of pyæmia. I take it that the mortality in future is likely to be extremely small, in spite of the advanced age of most of the patients, provided the greatest attention is directed to the prevention of loss of blood during the operation, and to asepsis or antisepsis. Most of the operations are, of course, so small as to be almost trivial. But in several of those which have been recorded, some of the tissues surrounding the ear have been removed; and, in one of them the glands below and behind the jaw were also dissected out.

Cures due to the Operation.—Although the material in my hands is very scanty, it exhibits results which are very encouraging. Taking the thirty-three records from the former edition and adding to them the four from Batzároff's Paper (*loc. cit.*), the figures are as follow:

Died of the operation	2
Lost sight of within a year	17
Dead or alive with recurrence	7
Died of other cause within three years	2
Died of other cause after three years	3
Alive and well from one to three years	2
Alive and well after three years	4
Total	37

Seven out of the twenty patients who were followed up can therefore be claimed as quite successful, while two other persons had died of some other cause than cancer, and two were alive and well, from one to three years after the operation. I believe it may fairly be assumed that the proportion of successful cases is more likely to be one-half than one-third. And, if the patients were brought for operation at a much earlier period, there seems every reason to predict a much larger success. The cases of rodent ulcer ought, broadly speaking, to be all amenable to cure by free removal of the diseased parts and an area of the surrounding sound tissues. And there is every reason to believe that the malignancy of true squamous-celled carcinoma of the ear is of a modified kind. For the glands behind and below the ear were only

removed in a single instance, either at the time of the operation on the ear, or later. Yet some, if not most, of the cases were cases of true squamous-celled carcinoma. I examined the disease myself in one successful case—that of a man who died of old age three and a half years after the operation. The microscopic structure was typical of epithelioma. In that case the patient was a schoolmaster, seventy-four years old, in whom the occipital aspect of the helix and concha were the seat of the ulceration (of six months' duration). The operation was limited to the free removal of the diseased parts of the ear, and did not comprise the whole of the pinna.

A single operation served in every one of the successful cases, and in not one of them were the glands removed.

Conclusions.—The removal of malignant disease of the external ear should be undertaken in all cases in which there appears to be a reasonable prospect of a successful operation.

The operation should comprise a wide area (three-quarters of an inch) of the tissues around the apparent margin of the disease, but it need not include the removal of the whole of the pinna.

The slow-growing cases are the best for operation, and are likely to prove the most successful.

At present, it does not appear necessary to remove the lymphatic glands behind and below the ear as a precautionary measure. It certainly is not necessary in cases of rodent ulcer.

Even if the glands are a little enlarged at the time of the operation, they should not be removed until the diagnosis * has

* As in some other chapters, I think it very desirable to draw the attention of practitioners to the enormous importance of an early diagnosis of malignant disease of the ear, and to the ease with which it can be accomplished. The ulceration, especially if it be "rodent," is often so innocent in appearance in its early stages, and surrounded with so very little induration that the dangerous character of the disease is not suspected. Steady and gradual extension in spite of treatment should certainly raise the suspicion of malignancy, and this suspicion may be allayed or turned into a certainty by the removal of a small fragment of the border of the disease, which can be cut in sections and examined microscopically. The removal can be effected without pain after the injection of a few drops of cocaine.

In all cases of malignant disease of the external ear, early operation means far less risk to life, and a far greater probability of permanent success.

been made between squamous-celled carcinoma and rodent ulcer. This can only be certainly done by means of the microscope. If the disease proves to be rodent ulcer, the glands may almost always safely be left. This is fortunate, because most of the patients are old, and the dissection of the glands behind and below the ear is very difficult, and attended with hæmorrhage, which is often very abundant.

CHAPTER IX

FACE

I SHALL not attempt to deal with the growths which occasionally affect the deeper structures of the face, but shall limit this chapter to the consideration of the malignant affections of the integument. The external ear and the lower lip are treated in separate chapters.

The parts of the face which are most frequently attacked are those which lie above the line of the mouth, particularly the region of the nose and eyelids. And the variety of malignant disease which is by far the most frequently observed is that to which the name of "rodent ulcer" has been applied in this country and the United States. The common variety of epithelioma, such as occurs on the organs of generation and various parts of the surface of the body, also attacks this region of the skin of the face, but much less frequently. Other varieties of malignant disease are just as rare as the two varieties of epithelioma are common.

I do not know what there is in the integument of the face to render it so peculiarly prone to cancer. Probably exposure has some part in the preparation of the tissues for the disease. And, as in the case of squamous-celled carcinoma of other parts, age plays an important part. Yet, in this respect, it differs from squamous-celled carcinoma, in its greater proneness to commence at an earlier age. Beyond this it is difficult to perceive what conditions decide the epithelial structures here so much more than elsewhere to undergo the cancerous transformation. Both sexes are so nearly equally liable to it that, of 210 cases which I have collected from various sources, 120 were of male patients, ninety of female. I fully expected to have found a much greater difference than this, and also that a large proportion of the patients were employed out of doors in occupations which subjected them to continual exposure to the weather.

But, although a large number of the 210 were hospital cases, many of the patients were of a much higher social grade, and many of the women followed only indoor pursuits, so that they may be said to have been almost entirely protected. It usually commences in the form of a small "wart" or plaque; if the latter, the plaque is generally slightly raised, smooth, waxy, and well defined. If this were let alone, it is not improbable that it would never develop, in a certain number of individuals, into cancer. Or better still, if it were completely destroyed or cut away while yet of small size and insignificant. But it is examined at very frequent intervals by the patient, is teased, and picked, and pulled, and made to bleed, until at length it acquires a greater extent, a slightly raised border, and a slightly, if ever so slightly, indurated base. If it has not been previously ulcerated, it now breaks down, and, for the remainder of its existence, is distinguished as an ulcer, not a tumour. But the sinuous margin of the ulcer is almost invariably characterised by its slightly raised and hard border, which may constitute the sole sign by which its relationship to a new growth is marked. The malignant ulcer is at first really trivial in extent and probably in importance; for it is superficial, and so easily removable that a snip with a pair of scissors might completely rid the patient of it in this early stage of its existence. And its progress is so slow that in the course of months or even of years it may appear almost stationary. Yet it slowly and, in most persons, continuously enlarges and deepens, destroying the true skin, the subcutaneous tissue, the muscles, fasciæ, periosteum, until it reaches the bone itself. Nor is its progress here arrested, although it may be for the time retarded. The bones of the nose, the orbit, and the cheek are slowly destroyed, and the disease may make its way into the cavities at the base of the skull and into the interior of the skull, and so reach the membranes of the brain. From the margins of the orbit it may reach to and destroy the eye, and spread across the bridge of the nose to the opposite orbit. From the orbit it may creep down the lachrymal canal to the interior of the nose, or, more boldly and openly, may break down the bony and cartilaginous barriers, and so enter the nasal cavities. Every surgeon is familiar with the awful ravages of the advanced disease, the vast chasm which is formed in the

very centre of the face, the destruction of the nose and of one or both eyes in the worst cases; and every surgeon admits the impotence of surgery against these very advanced conditions.

On account of certain points of difference between these rodent ulcers and the cancers of almost all other parts of the body, the cancerous nature of the disease was for a long time denied. The credit of having maintained the true nature of it is due to Charles Moore (*Rodent Cancer*, 1867), to Collins Warren (*The Anatomy and Development of Rodent Ulcers*, 1872), and to Thiersch (*Der Epithelialkrebs*, 1865). At the present time it is so generally admitted, that almost the only question which is still disputed is the exact layer of epithelium from which the cancer originates.*

The malignancy of these rodent cancers of the skin of the face is clinically shown by the manner in which they slowly spread, and involve and destroy every structure with which they come in contact, and by the tenacity with which they cling to the patient, and the impossibility of dislodging them, if they are permitted to attain a large size and to affect the deep structures. But it is remarkable that they scarcely ever affect the lymphatic glands, and that they are practically never associated with similar disease in distant organs and tissues.

Rodent cancer of the face is essentially a local affection, at first of limited extent and very limited thickness, and only slowly growing in breadth and depth, but capable of producing the most profound local effects. Unlike the cancers of many other parts of the body, it remains local to the very end, killing only by its local influence, pain, profuse discharge,

* The above description applies to the usual manner in which I have seen rodent ulcer of the face commence and develop. I have not attempted to deal with the rarer varieties. Those persons who are interested in all that pertains to the pathology of the disease should read a series of papers on the subject in the forty-fifth volume of the *Pathological Transactions* (1894), particularly the first paper by Mr. A. Bowlby. The various views on the exact origin of the disease are expressed and justified in these papers. And the rarer varieties are described, showing how there are rodent ulcers which never ulcerate, and rodent ulcers which have all the outward characters of the common form of epithelioma, and rodent ulcers which produce tumours as large as a tangerine orange instead of exhibiting the usual plaque or flat ulcer of rodent cancer.

meningitis, and encephalitis, or predisposing to death from intercurrent diseases. It may exist for twenty or thirty years without producing death, provided its course is very slow and does not involve a vital part.

Curiously enough, these cancers of the face sometimes exhibit a peculiarity which is scarcely ever noticed in the cancers of other superficial parts. They skin over and heal. But I cannot say that they are ever completely healed in this way. For the new skin only covers a small part of the sore in most instances, and the disease continues to extend at one border while it heals at another. Beneath the new skin, too, I have convinced myself that the essential structure of the cancerous disease may continue to exist and flourish ; so there need be no wonder that the cicatrix by-and-by breaks down and ulcerates again as if it had never healed.

Squamous-celled carcinoma (epithelioma) is very much less common. Its tendency is to run a more rapid course and to affect the lymphatic glands, but not to become disseminated.

Although cancer of the face is usually single, like the cancers of other parts of the body, there are numerous instances on record of multiple cancers, or of the occurrence of a second cancer at a distance from the first, either after the first ulcer has been removed or while it still remains untreated.

Methods of Operation.—The disease may be removed by means of scraping instruments, with the knife, or by caustics : or a combination of any two, or of all three, methods may be employed.

Scraping is very seldom employed unless for cancers of small extent and very superficial. Volkmann's sharp spoon is an instrument well suited for the purpose. The scraping, if it be selected for any special reason, must be carried deeply through the disease, and clear it thoroughly away down to and into the healthy tissues. I do not think it is a suitable method, used alone, of treating so formidable a disease as rodent ulcer undoubtedly becomes if it is not thoroughly dealt with in its early stages, for it does not ensure the removal of a sufficient area of the surrounding tissues. But it is often a very useful adjunct to the removal with the knife, particularly for cleaning the periosteum off the bone ; or may be used to clear away the bulk of the disease before the application of a caustic.

Removal with the Knife.—The differences in the situation, extent, depth, and relations of the various examples of cancerous ulcer of the face are so great that no definite rules can be laid down with regard to the exact operation which is desirable in an individual instance of the disease. There are, however, certain general rules which should be observed in every case, and I shall draw attention to them the more urgently because they have been too generally neglected. In the first place, it is of the utmost importance that the skin around the disease should be thoroughly cleansed before the performance of the operation. The same care which is bestowed on the skin of the breast, the abdomen, and other parts before an operation should not be grudged to the skin of the face. Indeed, there is greater reason for care, on account of the wrinkles which many of the patients exhibit, and the dirt of various kinds which lodges in them. When the deaths following operations come to be considered, the necessity of this and similar care will be seen. Erysipelas, pyæmia, meningitis, and gangrene make up nearly the whole of the causes of death, and I feel sure that one of the chief reasons for this is the want of care which is too often exhibited in preparing the patients for operation, and to the absence of sufficient, rather than to the want of proper, antiseptic dressings after it has been performed. In the second place, the line of incision must be carried far outside and beneath the disease, so as to remove a wide area of the surrounding apparently healthy tissues. No respect should be paid to the disfigurement which may follow free removal of the disease. The one fact to be borne in mind is, that if it recurs it will produce infinitely more disfigurement than even the widest operation for its removal, and that the difficulty of dealing with recurrent cancer is far greater and far less likely to be followed by permanent success than when the primary disease is treated. When the disease is of small extent and in an early period of its existence, the operator may the more cheerfully proceed to make a very free removal of it, on account of the far greater probability of completely ridding the patient of a loathsome and often painful malady. I have never yet seen reason to regret a too free removal of a cancer of the face, but I have seen reason, both for myself and others, to deeply regret that a wider removal had not

been accomplished when first the disease was dealt with by operation.

With regard to the method of preparing the integument for operation, it should be thoroughly washed with warm water and soap, scrubbed with a nail-brush if it is not very sensitive, then rubbed with pure ether, then with one in 1000 bicyanide of mercury solution, and kept covered with gauze soaked in one in sixty or one in forty carbolic solution for some hours before the operation. In cases in which there is extensive ulceration, the patient sometimes suffers such severe pain that he cannot even bear the lightest touch on or near the edges of the ulcer. Under these circumstances the preparation needs to be made under an anæsthetic. Often the best and safest preparation is made immediately before the operation, when the patient is anæsthetised, by scrubbing the surroundings of the ulcer with soap and water and a hard brush. The thoroughness with which this can be accomplished compensates for the disadvantage of not using one or other of the various antiseptics which are commonly used for the purpose.

Caustics.—Caustics have been very largely employed in the treatment of the earlier stages of rodent ulcer—more largely, probably, than any other means. But they have been employed in such a half-hearted fashion, and apparently with so little confidence on the part of the operator of really ridding the patient of the disease, that they have almost come to be regarded by the profession as an absolutely useless means of cure. There is not the slightest reason, however, why even extensive rodent cancers should not be treated by means of caustics with as thorough success as if the knife had been employed. Faint-hearted applications of nitric acid, the acid nitrate of mercury, Vienna paste, and chloride of lime, which are so used that they only destroy the surface of the disease and leave the base behind, do more harm than good.

In the few cases in which I have destroyed a rodent ulcer by means of caustic, I have employed Vienna paste, and with very good success. As there are now and again cases in which the patient will not submit to an operation with the knife, even for the removal of a small cancer of the face; or in which there are conditions which render the use of the knife inexpedient, it may be well to describe the manner in which the caustic should be used. Vienna paste consists of

equal parts of caustic potash and caustic lime, well powdered and mixed, and made into a paste, at the time of using, with alcohol. This paste is applied in a thick layer over the area to be destroyed, which must include half an inch of the apparently healthy integument all around the ulcer. The extent of surface to be destroyed may be exactly mapped out by a hole made in a piece of strapping, and the strapping, fixed down in place, serves to protect the surrounding integument from damage. The paste is kept on for ten minutes or a quarter of an hour, when the whole thickness of the skin and, with it, of the ulcer, has usually been completely destroyed. As the application is painful, the patient may have an injection of morphia a few minutes before it; or cocaine may be injected into the subcutaneous tissue. If a second application is needed on account of the depth of the ulcer, particularly if the bone is affected, Bougard's paste will be found more efficient (*St. Bartholomew's Hospital Reports*, vol. xxiii. 1887, page 57.)

The wound is usually slow in healing, and the treatment is very tedious; but there is no doubt of its efficiency, provided the caustic be used as deftly and with the same determination as the knife.

Results of Operations.—*Mortality due to the Operations.*—For the last edition I collected from several different sources, 206 cases of cancer of the face, in the large majority of which the disease was what is termed "rodent ulcer." Many of the cases had been treated by operation many years previously, so that the total number of deaths, twenty-one, was not regarded as excessive, when the severity of some of the operations was taken into account. The causes of death were pyæmia, two; erysipelas, nine; meningitis, five; collapse, marasmus, lung œdema, delirium tremens, and gangrene (one each), five. It is only to be expected that similar operations at the present time would yield a very much smaller percentage of mortality. And this is certainly the case. Batzároff ("*Ueber die malignen Tumoren des Gesichts*," Inaugural Dissertation, Zürich 1892) has collected all the cases treated by Professor Krönlein in hospital and private practice. They number seventy-five for the nose, eyelids, cheeks, forehead, chin, temples, and hairy scalp. Many more than seventy-five operations were performed on the seventy-five patients, for recurrence was

removed in many of them, and in some cases on several occasions. The disease was nearly always rodent ulcer or epithelioma (the sarcomas are placed under a separate heading). Four patients died of the operation, which was in many cases of very considerable extent. One of these patients died of an abscess in the frontal lobe, following necrosis of the roof of the orbit; another died of exhaustion the day after a very severe operation, at the beginning of which the common carotid artery was ligatured; the third of a combination of troubles, seventeen days after an operation for recurrent disease which was very extensive and necessitated the removal of a large fragment of the frontal bone and the exposure of the dura mater. The cause of death in the fourth case is not apparent; it occurred also after a severe operation for recurrent disease. The statistics of my own Hospital for the ten years from 1889 to 1898 inclusive furnish an excellent record. There were exactly 100 operations for rodent ulcer, with very few exceptions of the face, and only one patient died. He was a very old and feeble man and was suffering from advanced interstitial nephritis. I do not know how many of these operations were performed for recurrent disease, nor can I speak of the extent of them, except so far as my own cases go. It may probably, nay certainly, be taken that although some of the operations were very extensive and included the removal of the contents of the orbit and of large portions of bone, the majority of them were small, and some of them trivial. Nevertheless, the same thing holds good of the 206 operations in the last edition.

A fairer estimate of the danger of very extensive operations for the removal of cancer of the face may be gained from an interesting paper by Grosse (*Deutsche Gesellschaft f. Chir.* xxvii. 426, 1898) which contains an account of the removal of a number of very extensive cancers of the face by Professor Von Bramann between the years 1893 and 1898. In twenty-four operations on twenty-three persons, there were two deaths, a total mortality of rather more than eight per cent. A perusal of the paper will clearly show how extensive the disease and how grave the operation was in nearly every instance. One of the patients died of failure of the heart and the other of pneumonia, each within eight days of the operation.

I believe that very extensive operations for the removal of

cancer of the face may be performed on very delicate and aged people, provided the greatest care is taken to prevent any considerable loss of blood during the removal of the disease. In all cases of extensive disease the operation, so far from being hurriedly performed, should be very deliberately done. Pressure should be maintained by the surgeon and his assistant on the sound parts just beyond the incision, and every vessel should be dealt with as it is divided. The incision should be made step by step, so that the hæmorrhage from each step is thoroughly under control before the next step is commenced. By this means the hæmorrhage can be reduced to a minimum, and the danger of shock and failure of the heart is exceedingly diminished. I would venture to make another suggestion in the cases of delicate persons seriously enfeebled by the pain and distress of extensive rodent ulcers. The removal of the ulcer is almost invariably followed by relief from pain, which is often almost immediate. But the dressing of the wound for some time is peculiarly painful, and the patients not only look forward to it with reasonable dread, but are still further weakened by the changing of the dressings. In order to arrest the final oozing of blood after the operation, it is often expedient to cover the surface of the wound with iodoform or other gauze. The method is very efficient, but the removal of the gauze twenty-four or forty-eight hours later is attended with excruciating pain, so that even strong and determined men will almost scream with pain. This first dressing should be removed under an anæsthetic, which need only be employed for five minutes; or after an injection of morphia. Before the dressing is re-applied, the whole of the raw surface, after it has been irrigated with warm antiseptic solution, should be covered with little sheets of carbolised protective gutta-percha tissue which has been kept in an antiseptic solution. A number of tiny windows may be cut in the sheets, which should just overlap one another, to allow for the exit of discharge, and the dressing should be applied over this. Such a dressing may be changed every day with the least possible discomfort.

Cures due to Operation.—In spite of the improvement which has taken place in the diagnosis and general knowledge of the nature of rodent ulcer, I am not able to give as much better statistics under this heading as I expected to be able to do.

All that can be said is that about one-third of all patients operated on for cancer of the face may be regarded as cured by the operation. Seeing that the disease is almost invariably purely local, so that even the lymphatic glands are not affected in more than a very few per cent. of cases, and there is really no liability to dissemination, such a result can scarcely be regarded as satisfactory. Even now there are too many cases in which the disease is allowed to slowly extend until a large area of the integument is destroyed, or it has made its way into the orbit and down the lachrymal canal into the nose, or into the cavity of the antrum. Worse, instead of treating it with soothing applications, and protecting it against wind, rain, and dust, the surface is often irritated by the patient himself or by his medical attendant, by the futile application of caustics. And even when removal is undertaken, the fear of disfiguring the patient is so great that the incisions are carried far too close to the margin of the disease. This is particularly the case when the disease is situated on the nose close to the inner palpebral fissure, or anywhere in the neighbourhood of the eyelids. The consequence of these inefficient operations is, naturally, recurrence; and the recurrence is always worse to deal with than the original disease. If surgeons would only keep in view the horrible destruction and disfigurement which will surely be occasioned by the spread or the recurrence of the disease, and would therefore cut far beyond it, without ever considering the disfigurement occasioned by the operation, I am certain the proportion of complete successes would be speedily raised from one- to two-thirds.

Krönlein's seventy-five cases may be reduced to fifty-eight by deducting seventeen cases in which the patients died of some other disease than cancer of the face, or were lost sight of within a year of the operation. Of these fifty-eight patients, twenty-one had died of some other disease without recurrence of the cancer, or were alive and free from the disease more than three years after the last operation. The percentage is therefore just over thirty-six. Von Bramann's figures, even for extensive cancers, are better than this; but the total number of cases is small. Two patients died of the operation; one died of other cause than cancer within three years; three were lost sight of; eight were well from one to three years; and one died of other cause than cancer after

three years; while eight were well and free from disease after three years. The percentage of cured cases is therefore just over forty-seven. These are the best statistics I am acquainted with, and I can see no reason why they should not be improved largely for face cancers of large and small dimensions. I hope shortly to have my own cases collected and followed up. I know that, for private practice, they are extremely good; for I have been able to keep in view most of my patients, or to hear of them, up to the present time. But I have no knowledge of the degree of success which has attended the operations performed in the hospital.

One point must be alluded to—the possibility of recurrence of the disease at a much later period than three years after the last operation. I am perfectly aware of this, and admit it, for cancer of the face more frequently than for cancer of many other parts of the body. The slow growth of the disease may naturally be followed by equally slow recurrence. But the percentages are probably sufficiently correct, for the instances of long-deferred recurrence may be more than counter-balanced by the successful issue of many of the cases in which from one to two years only have elapsed since the operation.

Are patients who are not cured benefited by operation?—The answer may he given decidedly in the affirmative, provided the disease is removed so thoroughly that there is a long interval of freedom from recurrence. It is not merely that the advantage is obtained of ridding the patient for a more or less considerable period of a foul ulcer and replacing it with a scar. But an operation, if only for a few months successful, will sometimes relieve a patient of considerable pain. Several patients on whom I have operated from time to time without any real hope of curing them of the vast cancerous ulcers from which they have suffered have, after each operation, experienced marvellous relief from pain, even during the healing of the large wound made by the removal of the cancer. Of course, there is no question here, as there is in the surgical treatment of the cancerous affections of many other parts of the body, of what may be termed "shifting the position of the disease"—removing, for example, an ulcerating or very painful primary tumour with the hope of preventing local recurrence, yet with the full recognition that the patient will shortly die of the disease in the neighbouring glands or in some remote

organ. In the treatment of cancer of the face, recurrence *in situ* is usually the only problem with which we have to deal. If this can be prevented the patient is cured. If it cannot be prevented the relief which is afforded by an operation may be measured by the interval of freedom from recurrence and by the arrest of the steady progress of the cancer. In a large number of instances these advantages alone are worth the danger which the patient runs from an operation. The thoroughly disappointing cases are those in which the disease is of a peculiarly and unexpectedly malignant type, and in which recurrence is immediate, the recurrent disease appearing to have been rendered more active by interference. Such cases are, fortunately, very unusual.

Conclusions.—If cancer of the face is treated by free removal or destruction when it is of small extent, the prognosis is good.

In cases in which the disease is of considerable extent, and particularly in which it has invaded the cavities behind the face, the prognosis of treatment is not nearly so good.

The prognosis of the treatment of recurrent disease, unless the recurrent cancer is of very small extent and slow progress and is well situated for operation, is bad.

The sole object of treatment must be to prevent the *local* recurrence of the disease.

The treatment by cutting instruments may almost certainly be rendered less dangerous to life by greater care in the preparation of the patients, and perhaps in the after-treatment of some of them.

It is almost certain that the imperfect application of caustics does harm by irritating the disease and exciting it to increased growth.

The fear of disfiguring a patient by free removal or destruction of a cancer of the face must not be allowed to interfere with its thorough removal. It must always be borne in mind that the disease, if allowed to pursue its course, will produce a hundredfold greater disfigurement and distress than a thorough operation.

Half an inch, at least, of the surrounding healthy looking tissues should be removed or destroyed.

In no cases of cancer are early and free operations likely to be attended by such good results as in the case of primary cancer of the face.

CHAPTER X

LOWER LIP

THE lower lip is very rarely the seat of any other form of malignant disease than epithelioma (squamous-celled carcinoma). Men are so much more frequently attacked by the disease than women that epithelioma of the lower lip is regarded as essentially a disease of males. It is seldom observed in persons under forty years of age, and becomes comparatively more frequent during each decennial period of life. The prolabium is the part on which the cancer first appears, sometimes as a wart, sometimes as a scab, sometimes as a fissure or ulcer or crack. Either of these conditions may remain, with very little change, for many months or even years, and each of them may be regarded rather as a pre-cancerous stage than as an actual cancerous condition. The wart is picked off, and forms again; the ulcer or fissure is cauterised, and deepens. In the course of time induration forms around the base of the pre-cancerous condition, and may extend until it is out of all proportion to the wart or scab or sore. The latter, too, may spread along the prolabium, either laterally or in front towards the skin, and backwards towards the interior of the mouth. Of the two, it is more prone to spread along the margin of the lip, and may reach the corner of the mouth. After a variable period, extending in some instances over many years, the lymphatic glands become affected—those in the floor of the mouth and in the sub-lingual and sub-maxillary regions. The affection of the glands usually takes place slowly, and they are sometimes enlarged before they are actually cancerous, for, in some instances in which the primary disease has been removed and the enlarged glands associated with it have been left behind, they have subsided and the patient has made a complete recovery. From the glands first affected the disease may reach those of the neck, and may gradually extend until all the

lymphatic glands between the jaw and clavicle are cancerous. The primary affection also progresses until the whole of the lower lip may be diseased down to the chin, the gum and lower jaw may be invaded, the corner of the mouth destroyed, and terrible disfigurement of the patient's face ensues. The rate of progress of epithelioma of the lower lip is very variable, so much so that there are cases on record in which the disease has been present ten or fifteen years before it has been subjected to operation, and even then the glands have not been affected; while there are other cases, of which I have myself seen more than one, in which the cancer runs so rapid a course that the patient has died, within a few months of its first appearance, with very extensive ulceration of the lip and secondary affection of a large number of the glands.

The manner in which it produces death is usually by exhaustion from ulceration of the primary cancer and breaking down of the lymphatic glands, with the production of vast sloughing cavities in the floor of the mouth and in the neck. Even in those cases in which the disease has existed for several years, and the patient dies at length worn out by it, there is seldom any affection of other tissues or organs at a distance from the primary disease. Occasionally deposits are found in the lungs, the liver, or other parts; but this is a very rare circumstance.

Methods of Operation.—Only two methods are practically employed at the present time for the eradication of cancer of the lower lip—removal by the knife or scissors or galvano-cautery, and the application of caustics. The galvano-cautery and caustics are very much less frequently used now than they were a few years ago, and have almost entirely given way to cutting instruments.

Removal by the Knife or Scissors.—Of these instruments the knife is almost universally employed, and all ordinary forms of the disease are removed by one or the other of two incisions. Small indurations, not extending far along the margin of the lip, compact and not adherent to the parts behind the lip, are usually removed by a V-shaped incision, which includes the whole of the little tumour and a free margin of apparently healthy tissue on either side of it. The bleeding is staunched, and the two sides of the incision are brought together with hare-lip pins or sutures. The wound usually heals by the first

intention, the continuity of the prolabium is preserved, and, provided too large a slice has not been cut out, there is no sensible, or at least distressing, deformity of the mouth.

The second incision is crescentic, and is better adapted to those cases in which the disease has spread along the prolabium until an inch or more of it is involved. To take this out by a V-shaped incision would be to sacrifice too much of the margin of the lip, and to leave the patient in a distressing condition in consequence. The growth is therefore removed by a curved incision passing from one side round beneath it to the other side, taking care to include a free margin of the healthy structures. After the hæmorrhage has been stayed, the cut edges of the skin and mucous membrane are brought together by means of several sutures all along the length of the wound, so that there remains little or no open wound, and both the healing and final result are better than when the wound is left open.

It has been recommended that a microscopical examination shall be made of the diseased parts as soon as they have been removed, to discover whether there are any centres of cancer beyond the visible and tangible induration reaching quite up to the cut margin. But the impossibility of carrying out this scheme thoroughly, and the difficulty of distinguishing cancer centres from masses of cells of some quite harmless kind, have prevented any one from seriously attempting it. The surgeon, therefore, is content to be guided by the gross characters of the disease, and believes that the operation has been sufficiently carried out if he takes away half an inch of the tissues which appear to be healthy around the growth.

The two incisions which have been described require modification in those cases in which the disease is very extensive, or in which it affects the corner of the mouth or grows through the lip into the gum or jaw. It is necessary then to depart from what may be regarded as the routine course, and to make such incisions as may be needed for the complete removal of the disease without regard to the disfigurement which results. The infiltrated bone may be scraped and cauterised, or may be resected.

The disfigurement which necessarily results from operations such as these may be greatly lessened by plastic operations, but it is not within the province of this work to describe the operations which have been practised with advantage.

Enlarged glands beneath the jaw and in the floor of the mouth should be taken away as soon as they are discovered, provided they are removable. This rule of removing enlarged glands holds good for those cases in which the enlargement of the glands is not actually cancerous, for it is not usually possible to distinguish the characters of the non-cancerous from the cancerous enlargements, although the hardness of the affected glands is of importance in forming a correct opinion.

Caustics are employed occasionally by surgeons, and much more often by non-professional cancer-curers. It is not at all difficult to remove a cancer of the lip with caustic if the disease is limited in extent and neither deep nor adherent to the subjacent structures. Various caustics are used for the purpose, but none is better or more effectual than Vienna paste or chloride of zinc. No special preparation of the part is needed, nor is it necessary to destroy the superficial layers with any other variety of caustic. The surrounding prolabium is protected by a piece of thick plaster, from the centre of which an area is cut out of the size of the cancer and a little more. A paste composed of the chloride of zinc alone, or made up with a certain proportion of flour and water, is applied over the disease. A single application may suffice if the tumour is of very superficial depth. If it is deeper, the layer destroyed by the first application is scored through with a knife, and tiny strips of thin rag covered with the caustic are inserted into the scores. In the course of a few days, the time varying according to the size of the tumour and the toughness of the tissues, the dead mass falls off and a healthy wound is left behind. The use of caustics of whatever kind is usually attended with much more pain than is experienced after the removal of the disease with the knife. Although nothing appears more simple than to remove a small epithelioma of the lip by means of caustic, there is nevertheless room for error, and it has been justly remarked that operations of this kind are often far better performed by the commonest cancer-quacks than by professional men, because the quacks are constantly in the habit of using caustics, and continual practice has taught them how much and in what manner to apply the substance in each special case.

Results of Operations.—*Mortality of the Operation.*—The dangers due to the operation depend so much on its extent

that it is very difficult to give any definite idea of the average risk to life. The mere removal of a small cancer of the lip, whether it is removed by a wedge-shaped or a crescentic incision, carries with it very little danger, even when it is performed on very old men whose health is not robust for their age. But the case is very different when the operation consists in cutting away a large part of the lower lip, the removal of glands beneath the jaw, the excision of a portion of the lower jaw, and a plastic operation for the relief of the disfigurement due to the operation.

In the last edition I employed the large collection of cases put together by Wörner (*Beiträge zur klinischen Chirurgie*, ii. 129, 1886), which showed sixty-two deaths in 896 cases, a proportion of about seven to the hundred. I shall now add to these the cases collected by Fricke from the Göttingen Klinik between the years 1874 and 1896. His paper is admirably put together and is exceedingly valuable as the latest contribution to our knowledge of the surgery of cancer of the lip (*Deutsche Zeitschrift für Chirurgie*, l. 95, 1898). Of the 114 patients who were operated on during the twenty-two or twenty-three years in question, eight died of the results of the operation. The mortality is, therefore, almost precisely the same as that of the earlier collection of Wörner, which was taken from various sources. In fact, there are seventy deaths on the total of 1010 cases. Seven out of the eight patients in the Göttingen Klinik died of pulmonary trouble, and the eighth of collapse a few hours after the operation. Of these eight patients no fewer than five had undergone excision of a portion of the lower jaw, a circumstance to which I shall draw attention in the consideration of the value of these extensive operations for very extensive disease. Fricke attributes one of the deaths after the lesser operation to a tolerably large quantity of blood having been sucked down by the patient during the performance of the operation. And he considers that this danger is not very small. So far as my own experience goes I feel sure it can be avoided if the patient is placed on his side with the head well forward during the performance of the operation, a posture to which I have drawn attention in several chapters. If this is done no blood really enters the mouth, and there is no danger of sucking down blood and of consequent "Schluckpneumonie."

The mortality may be further diminished by not attempting

too much at a single operation on patients who are at all feeble. Where the primary disease of the lip is extensive, although not involving the jaw, and there is affection of the lymphatic glands, especially if it is considered necessary or desirable to remove the sub-maxillary and sub-lingual salivary glands, it is far safer to divide the operation into two parts. The disease of the lip should be removed first, and the defect remedied by a plastic operation. And when this has been recovered from, the glandular disease can be very freely dealt with. This course has another great advantage, that the wound in the floor of the mouth is not likely to be infected from the wound of the lip, which must necessarily be to some extent septic. Of late years I have been more and more disposed to divide dangerous operations about the tongue and throat into two parts. It is frequently possible to do so with great success, both as regards the completeness with which the operations are performed and the lessening of danger from the operations themselves. I only know of one objection to such a course, and I quite admit that it is a just one—the annoyance of having to subject the patient to two operations instead of one. There is no doubt that it is often difficult to persuade the individual of the necessity of undergoing a second serious operation for the removal of a disease of which frequently he is not conscious.

Cure of the Disease.—On the last occasion I found that the percentage of successful cases in 424 persons, a large portion of whom had been treated in the Bruns Klinik, was just over thirty-eight, and this I regarded as an exceedingly good result. But, as for the cancers of many other parts of the body, the later results are much better than the earlier, and I shall be able to show far better success than this in the cases reported by Fricke from the Göttingen Klinik. The Klinik was, during the greater part of the time, under the direction of Professor König. The total results for the 114 cases were as follows:

Died of the operation	8
Dead or alive with recurrence	37
Died of other disease within three years	9
Alive and well less than three years	8
Died of other disease more than three years	18
Alive and well more than three years	34
Total	114

The successful cases, composed of those persons who died of some other disease than cancer, or who were alive and well more than three years after the last operation, amount to fifty-two, and the total number of cases must be lessened by omitting the nine persons who died of some other disease than cancer and the eight persons who were alive and well within three years of the operation. Consequently the percentage of successful cases is no less than fifty-three, a very great improvement on the thirty-eight which was the best which could be shown a few years ago. Of these fifty-two persons twelve had lived for at least twelve years after the last operation, and the longest duration of life in any instance was eighteen years. Some of the patients who died without return of the disease lived to a very advanced age, eighty or ninety years. Besides these completely successful cases, there were four persons who had either died of some other cause than cancer, or were alive and well from two to three years after the last operation, and nine from one to two years, which allows a good margin for the few cases in which the "cured" patients may still suffer from recurrence in the lip or affection of the glands.

With regard to the class of cases which were successfully treated, only one of those for whom resection of a portion of the jaw was performed can be claimed to have been cured. In twenty-nine of them glands were removed from beneath the jaw or from the sub-maxillary region, or from both, but in three of these the glands are distinctly stated not to have been cancerous. So that removal of glands which were cancerous or which were suspected to be cancerous was performed in exactly half of the successful cases.

On this question of the removal of the lymphatic glands, Fricke's paper affords some valuable information. Wörner said that for some time before he published the report of the Bruns Klinik (*loc. cit.*) von Bruns had been in the habit of removing the lymphatic glands at the time of the removal of the primary disease, whether they could be felt to be enlarged or not. This has not been the custom of the Göttingen Klinik. Their rule has been to remove the glands in every instance in which they were palpably enlarged; and, even to make an incision behind the chin in order to be better able to feel slight enlargement and induration. They were very

frequently removed, for in addition to the twenty-nine successful cases in which they were removed, there were twenty-four other cases in which the patient was living or dead with recurrence of the disease, making a total of fifty-three cases in which the lymphatic glands were removed, and in almost all of which they either were, or were believed to be, cancerous. In thirteen of these cases, recurrence took place in the seat of the removed glands, and may have done so in some other cases, for the account of the manner of death or of the condition of some of the patients was derived from sources which were not reliable from a scientific point of view.

The question of the necessity of the routine removal of the lymphatic glands in all cases of cancer of the lower lip is by no means settled by Fricke's paper. In the first place, they were removed in twenty four of the thirty-three unsuccessful cases, but that did not serve to save the patients from recurrence. And, to make matters worse, the custom of removing them in every instance in which they were palpably enlarged was not strictly adhered to. In no fewer than eight of the thoroughly successful cases they were not removed, although they were decidedly enlarged. Yet the patients were alive from three to eighteen years after the operation on the lip. Why they were not taken out I do not know. But the history of such cases must not be allowed to prejudice the course which should be adopted as a regular rule. So far as I can see, at present, a routine operation for the removal of the glands in every instance of cancer of the lower lip is not called for. Affection of the glands frequently does not take place until the primary disease has existed for a very considerable period. For some reason the lymphatic glands are slow to receive and indisposed to develop squamous-celled carcinoma secondary to primary affection of the lip, a strange contrast to the readiness with which they become infected by precisely similar carcinoma of the tongue and tonsil. Under these circumstances, it appears to me sufficient to make a general rule of removing the glands in every instance in which they are appreciable. And, if the tissues are thick or very fat, so that there is difficulty in feeling slight enlargement of the glands, it is well to adopt König's method of making a small incision in order to ascertain their condition more directly.

The experience of the Göttingen Klinik of operations for

disease which has involved the lower jaw is very bad, and has led Fricke to express the opinion that in cases in which the jaw is already considerably involved it is better to abstain from a radical operation. A portion of the lower jaw was resected in ten cases. Five of the patients died of the result of the operation; four died of recurrence of the disease in from four to thirty months after the operation; and one was well and free from the disease about eleven years after it. The last case is the more extraordinary because the sub-mental and sub-maxillary glands were malignant and were removed with the ulcer of the lip. The primary disease was extensive and speedily returned, so that four and a half months later the recurrent disease and part of the lower jaw were taken away.

Speaking generally, very little success can be attributed to operations for recurrent disease. Possibly they might have been performed with advantage in some, or even in many, of the cases which ended unhappily, had the patients been seen by the operator as soon as recurrence of the disease was observed. But, as a matter of fact, only three of the fifty-two patients who had passed the three years' limit in Fricke's paper had undergone a second operation.

On one point I think a warning should be given. The very low degree of malignancy of many examples of cancer of the lower lip must not blind surgeons to the fact that individual instances may be met with of labial epithelioma which exhibit a malignancy of a very high order. One such case occurred in my own practice. There was a cancerous ulcer of the prolabium of a gentleman of fifty years of age, of small extent, and of several months' duration. As it occupied about an inch of the prolabium, and extended only a very little distance into the substance of the lip, I removed it by acresentic incision, taking care to remove with it a very free margin of the adjacent apparently healthy tissues. In spite of this, recurrence took place within three months, and the recurrent disease spread rapidly into the substance of the lip, which it destroyed as rapidly by ulcerating. I declined to perform a second operation, partly because the disease had recurred so speedily, partly because the patient, a very nervous, and not very healthy person, was just recovering from an apoplectic seizure. But the operation was performed elsewhere.

Within two months of it the man was dead. The glands beneath his jaw, which at the time of the second operation had not been appreciably enlarged, speedily grew to an enormous size; all the cervical glands became similarly affected, and there were signs of affection of the liver and of other of the internal organs. When first this patient came under observation there were no signs by which the disease could have been judged to be more malignant than usual. Nor had I the least idea, even before the second operation, that there was any immediate danger that the patient would die of it, although I judged, from its speedy recurrence, that it was much more malignant than the great majority of cancers of the lower lip.

Are patients who are not cured benefited by operation?—To this question an answer may be given certainly in the affirmative for all those cases in which, by a very trivial operation, the patient is temporarily rid of a disease which will in time prove horribly disfiguring and offensive, and may be very painful. When the tumour recurs *in sitû*, and the recurrence is beyond the reach of a reasonable attempt to remove it, no relief is afforded beyond the time during which the patient has been free from recurrence. To be rid of the local disease, if only for a time, is a great boon, by no means too dearly purchased by an operation of small magnitude. The horrible destructive ulcers which usually are produced in the later stages of the disease are bad enough; but I have seen large epitheliomatous masses of the lower lip which are even worse than the ulcers.

In accordance with the plan which has been followed throughout in this book, I have said nothing of the reparative operations which may be successfully practised after the removal of labial cancers of considerable size. An account of such operations may be found in various works on general and operative surgery.

Conclusions.—The removal of cancer of the lower lip may be undertaken in all uncomplicated cases with a very good hope of permanent success.

The operation should be performed at the earliest possible period of the disease, when it seems still doubtful whether the affection of the lip has actually become cancerous.

If the glands are enlarged, they should be removed; and,

if there is doubt whether they are enlarged or not, an opening should be made behind the jaw to ascertain their condition, in order to remove them as early as possible.

Recurrence of the disease, whether of the lip or of the glands, or both, should be removed as soon as it is observed, provided it is accessible to operation and the general condition of the patient offers no obstacle to the performance of an operation.

The prognosis in such cases is bad.

The prognosis is also exceedingly bad in those cases in which the disease, whether primary or recurrent, involves the lower jaw, and renders resection of a large fragment of the bone necessary. Such operations are attended by a high rate of mortality and are very rarely permanently successful.

CHAPTER XI

PAROTID GLAND

THE parotid gland appears to be subject to several kinds of malignant tumour: to round- and spindle-celled sarcoma, to spheroidal-celled carcinoma, and to endothelioma. Many of the tumours are composed of several different kinds of tissue and have therefore received the name of "mixed tumours." For the most part these have been regarded as innocent, for they contain large quantities of cartilage or mucous tissue; but some of them have been classified as chondrifying sarcomata. Very many of them contain a large mixture of what was at one time regarded as glandular structure, and was supposed to be derived from the epithelium of the parotid gland. When this structure was irregularly disposed, and the tumour presented the clinical aspect of malignancy, it was classified as a carcinoma. In consequence, twenty years ago almost all malignant tumours of the parotid gland were thought to be carcinomatous. As some of them appeared to contain a more or less considerable proportion of connective tissue elements, and were of embryonic type, such tumours were regarded as mixed sarcomatous and carcinomatous. Repeated and careful observations gradually led pathologists to the opinion that the majority of these tumours, if not all of them, were truly sarcomatous, and that the cells which had been regarded as epithelial were really of connective tissue origin. As a result of these views, the majority of malignant tumours came to be classified as sarcomata, and the occurrence of carcinoma appeared to be rare. During the last few years an entirely different view of the origin, and consequently of the classification, of these diseases has been suggested. They are supposed to be derived from the endothelial lining of the lymph-spaces, lymph-vessels, and blood-vessels. Hence the similarity of the cells to those of epithelium. Hence, the plexiform arrange-

ment which has so long puzzled pathologists. They are now classified as endotheliomata, and to such an extent has this view been adopted, that the sarcomata and carcinomata are crowded out from among the malignant diseases of the parotid gland. Nasse (*Langenbeck's Archiv*, xliv. 233, 1892) out of a large number of specimens, has seen *one* example of carcinoma of the parotid gland. Rudolf Volkmann (*Deutsche Zeitsch. f. Chir.* xli. 1, 1895) has never seen parotid carcinoma.

I am decidedly of opinion that the structure of many tumours of the parotid gland, particularly of the mixed innocent tumours, is most readily and properly explained by assuming that they are largely of endothelial origin. But I cannot pretend to judge how far this view applies to all tumours of the parotid. I can only say that I have removed within the last few years several tumours which presented all the ordinary microscopic characters of sarcoma, and more than one tumour which appeared to be a typical carcinoma. So that I am not yet prepared to erase the entire groups of sarcoma and carcinoma from the tumours of the parotid gland. I trust in the course of time that pathologists will be able to agree on the classification of the malignant tumours of the parotid, and that it will become as simple as it has hitherto been difficult.

In the meantime the only course left open to me in dealing with the subject from a clinical and operative point of view is to consider all malignant growths of the parotid under the common name of cancer or malignant disease, and to illustrate the different course which may be pursued from what I have seen and read.

The most malignant examples of cancer of the parotid gland run a very rapid course. They appear to be infiltrating from the first, are not encapsuled, and are very difficult to define. They grow quickly, spread from the gland to the surrounding structures, and produce secondary affection of the lymphatic glands. Secondary growths may occur in the liver, distant lymphatic glands, and other parts of the body, and the generalisation may take place within a few months of the appearance of the primary tumour, but generalisation does not appear to be of very frequent occurrence. The following case may serve as an example of this disease :

In December 1895 I was consulted by a gentleman, fifty-nine years of age, with a tumour about the size of a bantam's

egg in the right parotid gland. It had been noticed about six months. I removed it on January 10, and found a second tumour in its vicinity, but could not determine whether this was a second tumour of the same origin as the first or whether it was a secondary affection of a lymphatic gland. The tumours were not encapsuled or well circumscribed. Towards the end of March there was a recurrence, and on April 7 I removed the recurrent tumour and a number of smaller tumours which appeared undoubtedly to be lymphatic glands. The facial nerve, which had been partially divided at the first operation, was completely cut through and the operation was very extensive. In July there was extensive recurrence in the glands. In August there was a glandular tumour in the right inguinal region. In November the right arm became enormously swollen from internal disease, and in the course of two months the spread of the disease proved fatal. The tumour was pronounced to be a round-celled sarcoma. So, too, I removed a sarcoma of the parotid gland from a woman in the hospital. It was associated in the same manner with secondary tumours of the lymphatic glands, and the operation could not be satisfactorily completed so far as the removal of the whole of the disease was concerned.

On the other hand, some of the malignant growths of the parotid exhibit a very mild malignancy. A young woman, not twenty years of age, was admitted to the hospital for a tumour of small size in the parotid gland. It was associated with paresis of the orbital fibres of the facial nerve. I removed it, and found it encapsuled. The facial nerve was adherent to the upper part of the capsule, but was separated from it without further injury to its conducting power. The tumour proved to be spindle-celled. About two years later, she returned with a very small recurrent tumour, not at the upper part of the old scar of the former operation (where I feared it would recur, and destroy the facial nerve), but at the lowest part, fortunately far away from the facial nerve.

The occurrence of paresis of the facial nerve in this case (the paresis was still present at the time of the second operation) raises the interesting question of the general relation of paralysis of the facial nerve to tumours of the parotid. Billroth, speaking of the diagnosis of malignant disease of the parotid, stated as the result of his experience,

that facial paralysis generally signified that the tumour was carcinoma, for the sarcomas and mixed tumours rarely produced paralysis by pressure. My own experience, having this statement of Billroth always before my mind, has been that paralysis is rarely or never produced by an innocent tumour, however large the tumour may be; but that malignant tumours, whatever their variety, are not infrequently associated with facial paralysis. In the case which has been just described, the tumour was quite a small one, and the paresis was not produced by pressure, but by involvement of the nerve in the growth of the tumour. I would not venture to aver that every tumour of the parotid which is associated with paralysis or paresis of the facial nerve is malignant, but I can say that I have never yet seen facial paralysis produced by an innocent tumour of the parotid, and that I regard the occurrence of paresis or paralysis of the facial nerve as a most valuable symptom in the diagnosis between innocent and malignant growths.

Both males and females are subject to parotid carcinoma; and, although Busch has reported one instance in a boy eleven years of age, it is a disease essentially of adult age, and rather of the middle and the later periods of adult life. The manner in which death is produced is various. The growth may reach the skin and ulcerate, and death may be due to causes connected with this accident; or there may be pressure on the food- and air-passages, or secondary growths may prove fatal by affecting vital organs.

Methods of Operation.—The removal of a malignant tumour of the parotid is sometimes an operation of little difficulty and practically of no danger; but the larger tumours can only be removed by a difficult dissection, while the removal of some of them is a matter of the gravest difficulty and danger. Large veins are wounded and bleed abundantly, and the carotid artery may be cut.

No one incision or operation will serve for every instance of parotid tumour. But the line of incision which is commonly observed is a vertical incision at the posterior margin of the tumour, and this is usually supplemented by a transverse incision from the centre of the first across the tumour from behind forwards; or, a curved incision is made below and behind the angle of the jaw. The flaps which are formed are

turned back, and the surface of the growth is thoroughly exposed. If it is encapsuled, it may sometimes be shelled out without difficulty. But whether it is encapsuled or not, if it is adherent it must be removed by a careful dissection, the edge of the knife being kept always close to it, so as, if possible, to avoid wounding any important artery or, worse still, the facial nerve. If the nerve is stretched out over the tumour, it may be dissected off its surface, the operator working as far as possible in the long axis of the nerve. This is, of course, difficult when the nerve lies on the under surface of the growth. The lower margin of the tumour is then usually raised up from its bed, and the dissection is carried up beneath it.

I am disposed to think that, hitherto, we have been too solicitous for the welfare of the facial nerve, and too cautious in our operations for the removal of malignant tumours of the parotid. The operation has almost invariably been limited to the mere removal of the tumour. Hence, perhaps, the frequency of recurrence, especially in the case of carcinomas and of the larger sarcomas. In other parts of the body, where there are no large vessels or important nerves in the vicinity of the tumour, malignant disease is removed much more freely, and the operation is made to take in as large an area of the surrounding healthy textures as may seem to be desirable. If every carcinoma and large sarcoma or recurrent sarcoma of the parotid were treated by the complete and methodical resection of the parotid gland, the results might be better. Mandowsky (*Ärztlicher Praktiker*, 1894, No. 32 and 33) has described an operation which Professor Schüller has practised with this object in view. Instead of attacking the gland on all sides, or from behind, or from below, as is frequently done, the parotid is separated from the adjoining parts above and in front, and the fossa behind the jaw is approached from above and in front, each vessel being doubly ligatured and cut through as it is encountered. By this proceeding, the relations of the gland are much more easily distinguished; the bleeding is much less considerable, and the tumour having a natural tendency to hang downwards and backwards renders the dissection of the fossa very much more easy. Of course, no attempt is made to save the facial nerve, which is dissected away with the gland. The resulting disfigurement is, undoubtedly, very

distressing; but it must not be permitted to interfere with the improved prospect of saving the patient from recurrence of a fatal disease.

The wound left by removal of a tumour or of the parotid gland may be drained and treated in the same manner as any other wound of a similar kind. But the depth of some of these wounds, and the difficulty of applying sufficient pressure to control the after-hæmorrhage, and the necessity for pressure on some of the small vessels which cannot be successfully tied on account of their close proximity to the bone, may render it necessary to plug the cavity for the first twenty-four hours with iodoform or other gauze. I do not remember ever to have tied the carotid artery in any of these operations; certainly I have never done so as a preliminary to the operation. If the disease appears to be so extensive as to render such a precaution needful it is probable that the operation will be quite useless, and had better never have been undertaken.

Results of Operations.—I am afraid, owing to the circumstances which have been described, it is quite impossible at this moment to sum up the relative dangers and chances of cure due to operation, or to give a much better idea of them than is afforded in the relation of the cases which have been recorded in the foregoing pages. Owing to the fact that innocent tumours were included amongst the sarcomas in the last edition, it is quite certain that the severity of operations for the removal of sarcoma of the parotid were underestimated. On the other hand, the operations for the removal of carcinoma which probably included a certain number of cases of sarcoma and more cases of malignant endothelioma, afforded a larger mortality than I think equally severe operations would be likely to do to-day. Three out of seventeen patients were reported to have died of the operation itself, but there was reason to believe that the death of one of the three was rather due to dissemination of the disease than really to the operation, for he lived eighteen or nineteen days, and after death was found to have secondary growths of the liver and mesenteric glands. Even if this case is left out of consideration, two deaths in seventeen cases affords a percentage mortality of very nearly twelve. As there are no special dangers incident to the removal of the parotid gland, and death is usually due in these days to hæmorrhage or to shock, or a combination of

the two, a mortality of twelve per cent. is certainly very much larger than need be expected in the future, even if very large operations are performed. I believe the more methodical and complete removal of the parotid gland, with the tumour in it is likely to be attended with less danger than the practice which is much more usual, of taking the tumour out of the midst of the gland in which it lies. The dissection is of course deep and difficult, and the carotid artery may need to be laid bare for some distance. But the advantage of being clear of the adherent tumour, and of seeing the vessels better when they are reached, will more than compensate for the extent of the removal. I have already suggested that the cavity may need to be plugged with gauze in order to arrest the abundant oozing which commonly occurs after the larger operations.

With regard to cure, I can only say that, up to the present time, there are very few instances of cure by operation of undoubted malignant disease of the parotid. Yet there are a few cases; and there are cases of undoubted sarcoma, such as that which I have related, in which the course of the disease is mild and recurrence, even if it does take place, is long deferred. The most hopeless cases are those in which the lymphatic glands are affected. They certainly are very bad indeed.

I look with more confidence to the results of the future, if certain conditions are complied with. The operation, in all cases of undoubted malignant disease, should comprise the methodical exposure and removal of the parotid gland. The possibility of saving the facial nerve should be left out of consideration. There are rare instances in which the facial nerve lies external to the gland, and in that event the nerve may be preserved. But it is probable this fortunate disposition will only be discovered when the operation is concluded, and the patient is found not to be paralysed. In the next edition of this book I hope that the results will be found to be fairly good, both with regard to the mortality of the operation and the cure of the disease.

CHAPTER XII

JAWS

UPPER JAW

THERE are difficulties in dealing with the tumours of the upper jaw which are not experienced in dealing with the tumours of the long bones, and the chief of these difficulties is to determine the origin of the disease. The tumours of the antrum grow from different structures, and it is usually quite impossible to discover whether the sarcomas are of central or sub-periosteal origin. Some malignant tumours which are usually described as tumours of the upper jaw take their origin in the ethmoidal or sphenoidal cells; others grow from the nose into the antrum. The account, therefore, of the malignant tumours of the upper jaw, and the records of the results of operations performed for their removal, are not so accurate from a scientific point of view as those of many other parts of the body. I hope, nevertheless, it may be possible to give a general outline of the course of the disease, as it is observed in the very large majority of instances, such as may be useful in relation to operative surgery.

To begin with, let me state that I shall employ "upper jaw" and "antrum" as synonymous terms, for I have no intention of dealing in this section with the tumours which affect the adjoining sinuses or bones, or even with the tumours which are limited to the alveolar process of the upper jaw. Nor shall I do more than mention those operations which consist in cutting away a part of the wall of the antrum for a growth situated within the substance of the bone, or in the removal of part of the nasal or the palatine process. The tumours I am about to describe are such as affect the antrum, and require the complete, or almost complete, removal of the upper jaw-bone.

Both sarcoma and carcinoma may affect the antrum, but the larger number of malignant tumours appear to be carcinomas.

Again, almost every variety of both sarcoma and carcinoma may be found, but the majority of the sarcomas are round-celled and the majority of the carcinomas are spheroidal or squamous-celled. For our purpose it does not seem necessary to separate the sarcomas from the carcinomas in the consideration of the general course pursued by the disease; but it is necessary to devote especial attention to one form of carcinoma on account of the peculiar course which it pursues. I refer to the squamous-celled carcinoma or epithelioma.

Carcinoma is a disease of adult age, and rather of advanced adult age, while *sarcoma* is often found in younger persons, and may even occur in children. Both sexes are liable to both forms of disease, but they attack men more frequently than women. Sometimes the appearance of the tumour is preceded by pain, but in many instances there is no pain until the disease is advanced. The first sign of serious disease is the appearance of a swelling of the face over the antrum or of fulness and obstruction of the corresponding side of the nose. With the fulness of the nostril there may be discharge of bloody fluid. The swelling gradually increases, not only in the directions in which it first was noticed, but also up towards the orbit, down towards the mouth, and back into the spheno-maxillary fossa. The eye may be pushed up and the hard palate pushed down, but the swelling in the fossa is not so easily perceived. The nostril on the affected side often becomes completely obstructed. As the disease advances, the bony wall may be destroyed and protrusion may take place, with affection of the soft parts around the bone. The skin of the face in this way becomes adherent to the tumour and immovable over it, and the result may be a vast ulcer, with the thrusting forth of a fungous mass. The neighbouring sinuses are frequently involved, so that the tumour may reach the horizontal ethmoid plate and thence extend into the interior of the skull. The lymphatic glands, whether in front of the ear or behind and beneath the lower jaw, are seldom affected, yet I have seen them enlarged in very rare instances at a comparatively early period of the disease. The rule, however, is that the tumours of the antrum either do not affect the glands, or only do so when the disease is very advanced. The tumour may kill by the local effects which it produces, whether it extends to the interior of the skull or not, or dissemination

may take place in the liver, lungs, skin, bones, and other organs and tissues. The natural duration of the disease varies much according to the character of the tumour. The round-celled sarcomas and the softer forms of carcinoma run a rapid course, and may prove fatal in less than a year, but the spindle-celled tumours may exist a much longer time without producing death.

Squamous-celled Carcinoma (epithelioma) attacks men and women, but men more frequently than women. It is a disease of middle and advanced adult age. The formation of the tumour probably commences in the mucous membrane of the alveolar process in connection with a carious tooth, or stump of a tooth, or in the socket from which a tooth has been removed. There is usually very little swelling of the affected portion of the bone, and the earliest symptom of the disease is violent toothache. To relieve this pain one or more teeth may be extracted, and as the apparent result of the extraction, or independently of it, a sinus forms, through which there is a discharge of fetid pus A probe passed into the sinus may strike on crumbling bone, or, and this is commonly the case, may pass directly up through the alveolar process into the cavity of the antrum, which may feel as if filled in whole or part with soft tissue resembling granulation tissue. Even now, and although the patient's toothache has not been relieved by the removal of the teeth, the real nature of the malady may be unsuspected, for it is singularly insidious. The epithelial growth extends into and fills the antrum, destroys its bony walls, reaches the lower wall of the orbit and destroys it, passes up into the sinuses in the ethmoid and sphenoid bones, reaches the base of the skull, gives occasion to great pain, yet presents even to close examination scarcely any sign of a tumour. The new growth replaces the destroyed structures and fills cavities, but seldom grows so far beyond or out of them as to produce actual swelling, except such as may be mistaken for the effects of inflammation and necrosis of the bone. The resemblance to the effects produced by necrosis is still further strengthened by the sinuses which form, and which are not always limited to the alveolar process. I have seen them in the cheek, below the orbit, and by the side of the nose. The lymphatic glands are only rarely affected. The course of the disease is often so rapid that within a few weeks of the first pain and sign of

mischief in the alveolar process, and when there is yet scarcely any sign of actual tumour, it may be beyond the reach of operative treatment. I have myself attempted its removal by complete removal of the upper jaw within seven weeks of the first sign of any affection of the mouth, and have found that the whole of the bone was destroyed, and that the new growth had extended into the neighbouring sinuses and into the muscles around the upper jaw, so that the complete removal of the disease was impossible with safety to the patient. And I have been present at operations performed on patients whose symptoms dated from only two or three months previously, and yet, in spite of the fact that there was no visible tumour and the diagnosis was still uncertain, the disease had advanced so far that it was not found possible to remove it. Death is usually due to exhaustion, and occurs, as might be expected from the account which has been given, at a very early period of the malady.

Methods of Operation.—When the disease is limited to the interior of the antrum, it may be scooped out after a sufficient opening has been made for the purpose. When the bone is implicated, the superior maxilla is removed, either wholly or with certain reservations.

Enucleation of the Tumour.—A flap of the soft parts is turned down by making a horizontal incision from the inner angle of the orbit along its lower margin, and a second incision from the angle of the orbit down by the side of the ala of the nose to its lower margin. The bleeding vessels are tied. An opening is made into the cavity of the antrum through its front wall of sufficient size to allow the interior of the cavity to be thoroughly examined and its contents to be removed. If the disease is limited to the antrum, and has not grown into its walls at any point, the tumour may be shelled or scooped out with a sharp spoon. There is not likely to be serious hæmorrhage. It may, however, be necessary to plug the cavity with a strip of lint, the end of which is brought out behind the cheek into the mouth so that it can be withdrawn the day after the operation. This same opening serves for the escape of the discharges until the healing is accomplished, and through it injections of antiseptic solutions may be introduced by means of a syringe, or powders of iodoform and borax may be insufflated. The flap which was

turned down is very carefully adjusted and sewn in place with fine silk or gut sutures; and, for the better insuring of healing by the first intention, collodion may be painted along the line of the incision. Instead of the incision just described, a flap may be turned *up* by an incision through the upper lip along the columna, round the margin of the nostril, and along the side of the nose as high as may be needful. This is, in my opinion, the better method of performing the operation, because less deformity is left by it, the antrum is opened at its lower part, and the escape of discharges results more naturally.

Removal of the Upper Jaw.—The usual operation by Fergusson's method, in which the incision is carried along the side of the nose and horizontally along the lower margin of the orbit, is so well known and so frequently practised that it is not necessary to describe it in detail here. I prefer it to the operation in which the incision is carried up through the cheek from the angle of the mouth, both on account of the greater freedom with which it permits the operation to be performed and of the less marked scar. But there is undoubtedly a defect which not infrequently results from Fergusson's operation which has not received the attention it deserves. When the lower margin of the orbit has been removed, the lower eyelid often swells, becomes red and œdematous, and may remain so in spite of every means taken to relieve it. The disfigurement produced by this cause is very marked, and is, I think, not less than that which results from the lower incision. The chief reason, then, for selecting Fergusson's incision is that it allows the operation to be more easily performed and the hæmorrhage to be more readily controlled. After the removal of the bone, the edges of the wound are brought together with the greatest care, especially about the angle of the orbit and at the lip, to preserve the line of the prolabium. The line of incision is painted with collodion, the cavity filled with long strips of gauze, and the patient returned to bed. The gauze is usually removed on the day after the operation, but may be left another day if there is fear of hæmorrhage. The chief points in the after treatment are to keep the cavity sweet, and to see that the patient takes a sufficient quantity of food. The first indication may be fulfilled by frequent gentle syringing with solutions of antiseptic materials, or, better still, by the insufflation three

times a day of powders composed of iodoform and borax in equal quantities or with as much more iodoform as may appear necessary in the individual case. The second indication may be met by feeding the patient through a syringe or funnel or tube. These points will be again referred to in the discussion of the results of operations.

Removal of the Upper Jaw, with the Exception of the Orbital Plate, may be performed through the same incision as in Fergusson's operation along the side of the nose, but the horizontal incision may be omitted, or may be modified by much shortening its length. When the soft parts have been raised off the bone by one or the other of these incisions, the alveolar process and palate are cut through as in the major operation, the soft palate having been detached from the posterior margin of the hard; the malar process is sawn or cut through in a direction from above downwards and from within outwards, and a section of the bone is made from the malar process through to the nostril by means of saw or cutting forceps just below the orbital plate. The bone is then removed by wrenching it out with the lion-forceps and dividing the soft parts which are still adherent to it; the hæmorrhage is arrested; the under aspect of the orbital place is examined to be certain that it is free from disease; and the outer wound is closed, the cavity being treated in the same manner as when the whole jaw has been removed.

To diminish the risk to life from the larger operations it has been recommended that the external carotid artery, or that both external carotids, should be ligatured, and this has been done in a large number of cases, as Joseph Bryant's paper (*Transactions of the New York Medical Society*, 1890) shows. One death was directly attributable to the operation out of eighty-five cases in which the artery was tied. Senger suggests that temporary ligature of the vessel would suffice to prevent serious bleeding at the time of the operation.

Küster has been in the habit of performing a preliminary tracheotomy, and plugging the trachea with Hahn's or Trendelenberg's tube.

Results of Operations.—*Mortality due to Operation.*—I am sorry still to have to report a considerable mortality, although it is not so large as it was before 1887. In the first place, it is possible to put together a much larger series

of cases than I could command at that time. Joseph Bryant (*loc. cit.*) has collected from various sources 107 cases of excision of one upper jaw for malignant disease, in which the entire jaw was removed, and 7 cases in which both upper jaws were removed, making a total of 114 cases with 15 deaths, not one of which occurred in the cases in which the operation comprised the removal of both upper jaws. This is the smallest mortality recorded on a large number of cases. In order to compare it with other statistics, which were not likely to include the cases collected by Bryant, I have taken the statistics of St. Bartholomew's, St. Thomas's, and University Hospitals between the years 1886 and 1897, which contain 127 cases of operation for malignant disease, with 16 deaths But I am not sure that every one of these operations comprised the entire removal of the maxilla. The mortality is very similar to that deduced by Bryant. I then take the most important recent contribution to the subject of malignant disease of the upper jaw (*Zur Kenntniss der bösartigen Oberkiefergeschwülste und ihrer operativen Behandlung, Deutsche Zeitsch. f. Chir.* xliv. 483, 1897) by Dr. Max Martens, which deals with all the cases treated in the Göttingen Klinik between October 1875 and October 1896. Almost all the operations were performed by Professor König, so that the paper is practically an account of König's experience. It is the more valuable, because the further history of the patients who recovered from the operation is recorded, and will form an important part of the next section. Seventy-four total resections of the upper jaw were performed with the very large mortality of 22 (or, perhaps, 23), making almost a thirty per cent. mortality. This is almost exactly the same percentage as the first edition of this book related. At first I thought this large mortality in the hands of so excellent a surgeon must have been due to a very heavy mortality in the earlier cases, and that the cases of the last few years would furnish better figures. But that is not so. The mortality does not appear to have appreciably diminished. Martens particularly draws attention to this, and shows how the mortality of upper-jaw resection increased in the Prussian University Klinik between the beginning of 1888 and the end of 1892. The real reason of the larger mortality is undoubtedly to be found in the far larger operations for malignant disease which have been performed during the last

few years, and which have more than counter-balanced the advantages of the later methods of treatment of wounds.

The causes of death are deserving of the closest attention. Bryant says that four per cent. of the deaths in his tables were due to primary hæmorrhage; which is a little larger than in the table which I prepared in 1887, and larger than is found in Martens' table. Loss of blood is probably responsible for a larger number of deaths than appear in the tables. Surgeons are not disposed to admit death from primary hæmorrhage if it can be explained in any other manner. But the proportion of deaths from "anæmia" and "exhaustion" is very suspicious. The great majority of the deaths were due to septic affection of the lungs, a certain number to affections of the lungs which are not apparently septic, and most of the remainder to collapse, shock, and exhaustion. Downright pyæmia and septicæmia are now rarely encountered, but the rate of mortality from the other causes is as large as it was years ago. There were also several deaths from meningitis or abscess of the brain, which were attributed, or actually known to be due, to interference with the base of the skull during the operation. The septic pneumonia proved fatal in from two to twenty days after the operation, so that some of the patients must have been attacked within a few hours of their return to bed.

The two dangers to which these operations are peculiarly exposed are, as far as I can see, loss of blood and exhaustion (which frequently go together) on the one hand, and septic affections of the lungs on the other hand. Our efforts, therefore, in the future, must be directed to the reduction of the mortality from these causes.

It is impossible to avoid a considerable loss of blood during the operation, especially if it is of such large extent as it frequently was in the Göttingen Klinik. But I am sure the hæmorrhage is likely to be greater if the head is hung over the end of the table, and I think too great a quantity of blood is often lost in the skin incisions, through performing this part of the operation very rapidly, and not taking up the vessels as far as possible at the moment they are divided. When once the large skin-flap has been raised off the front surface of the antrum, and all the bleeding vessels have been either temporarily or permanently secured, the more quickly the

disease can be removed and the large cavity plugged with sponges or masses of gauze the better. I have never ligatured the carotid arteries as a preliminary step to the removal of the jaw, nor am I inclined to do so. The ligature of the common carotid is so dangerous in itself (from interference with the circulation of the brain), especially in old people, that it cannot be recommended. And the ligature of the external carotid does not seem to have been sufficiently successful to encourage a frequent resort to it. In some instances, both external carotid arteries have been ligatured on account of the small advantage which appeared to be gained by the ligature of one of them.

It is very disappointing that the almost complete disappearance of general blood-poisoning (erysipelas, pyæmia, and septicæmia) from the list of causes of death has not been attended with a similar disappearance of septic affections of the lungs. Swallowing-pneumonia (Schluckpneumonie) from food entering the air-passages is uncommon, and can be almost certainly prevented by feeding the patient through a tube in cases in which there is difficulty in swallowing during the first few days after the operation. But swallowing-pneumonia from the sucking of blood into the air-passages and from the foul discharges which proceed from the large wound is far too common. Tracheotomy and the introduction of Hahn's tube might serve to prevent the entrance of blood into the air-passages during the operation in a very large number of cases. But I have no doubt that tracheotomy, whether it be performed several days previously, or at the time of the resection, is in itself very undesirable, and adds to the difficulty of the after treatment of the patient. The operation is frequently performed in the Göttingen Klinik, but the number of cases of septic pneumonia has nevertheless been very large.

Neither do I like the recommendation by Martens of the morphia and chloroform narcosis with the patient in the sitting posture. I quite admit that it may be preferable (as he suggests) to the hanging of the head over the end of the table. But I believe it to be far inferior to the lateral posture of the patient, which I have employed now for some time past in operations on the interior of the mouth or throat, with the head forward, so that the blood inclines to run naturally out of the mouth rather than down the throat.

On the best method of dressing of wound I am for the most part in accord with the Göttingen Klinik. Iodoform is certainly the best application for the internal wound, but I prefer it in the form of powder. I almost invariably plug the wound carefully in the first instance with iodoform gauze; but when that is removed on the first or second day after the resection, I seldom replace it with gauze, but insufflate iodoform several times a day on the surface of the wound in the mouth. In addition, I see that the patient lies for the most part on the side, with only one thin pillow beneath the head, so that the discharges tend to run out of the mouth.

Cures due to Operation.—Although so considerable a decrease in the mortality due to the operation as I hoped for in the last edition has not been achieved, chiefly owing to the much larger operations which have been performed, it is nevertheless sure that the mortality due to such operations as were usually practised up to the end of the eighties has been lessened almost to one half. And it is equally sure that I shall be able to show a much more hopeful prospect of the results of the cases in which the patients recovered from the operation. To this I am entirely indebted to Martens, for other papers published during the last few years on malignant disease of the upper jaw contain little or no information on the further history of the patients.

Eighty-four patients were subjected to operation in the Göttingen Klinik, fifty-seven of whom suffered from carcinoma, and twenty-seven from sarcoma. Seventy-two (carcinoma forty-eight, sarcoma twenty-four) of them underwent total resection of the upper jaw, and in many of the cases, the operation was extended very widely into the surrounding structures. In twelve cases (carcinoma nine, sarcoma three) a partial resection was performed, but in nearly every case a partial resection of considerable extent. The results of the total resections were:—

Died of the operation	23
Dead or alive with recurrence	33
Well less than three years after operation . . .	2
Well more than three years after operation . . .	14
Total	72

The results of the partial resections were:—

Died of the operation	1
Dead or alive with recurrence	6
Well less than three years after operation	3
Well more than three years after operation	2
Total	12

The mortality due to the operation itself is, of course, very large. It occurred in nineteen cases of carcinoma and only in four cases of sarcoma; so that it was nearly five times greater for the carcinomas instead of twice greater, as it ought to have been. Whether this was accidental and due to the condition of the patients, or to the disease having come into the hands of the surgeon very late in the cases of carcinoma, I do not know. Perhaps, if the mortality had not been so disproportionately large for the carcinomas, the remaining results would have been more proportionate. As it was, recurrence took place in twenty of the twenty-nine surviving cases of carcinoma, and in thirteen of the twenty surviving cases of sarcoma. Eight of the patients suffering from carcinoma were cured and six of those suffering from sarcoma; and in one case of each disease a period of less than three years had elapsed since the operation.

The partial resections furnish a very curious experience. All the nine patients who were operated on for carcinoma recovered from the operation. The full period of three years had not elapsed in three of the cases when Martens sought the patients out. The remaining six patients were all dead, or living with recurrence of the disease. Of the three cases of sarcoma one was fatal from the operation and the other two were cured by the operation.

The results, so far as successful cases are concerned, are so much better than I expected from my previous study of the disease, that I have looked very closely into the character of the cases in order to discover as far as possible the causes of success.

In the first place, this is the first, indeed the only, series of cases in which the further history of the patients has been carefully followed up, and affords another proof of the justice of the opinion I have always held—that the greatest, and the greatest number of, successes will be found among the patients who are lost sight of after they have recovered from the

operation. I have myself experienced this in the search for old cases of cancer of the breast, the larynx, and the tongue, and Martens now shows it for the upper jaw.

In the second place, the Göttingen Klinik appears to have formed a different conception of malignant disease of the upper jaw to that which has been generally held. In the former edition of this book it was pointed out that the disease, whether sarcoma or carcinoma, is very infective locally, but that there is little disposition to affection of the lymphatic glands. The "boring" epithelioma was particularly regarded as a very rapidly spreading local disease. But dissemination of the sarcomas and of the glandular carcinomas was looked upon as much more probable than it appears really to be. Martens lays down the proposition that malignant disease of the upper jaw displays its malignancy chiefly in its great tendency to recur *in sitû*. Dissemination, whether in the lymphatic glands, or in other parts of the body, is proportionately rare. Whether this view of the disease actuated the Göttingen surgeons throughout the whole series of operations, I do not know. But it is distinctly enunciated by Martens in his paper, and has evidently been the standpoint from which König has been working for some time past.

That it is justified by the results, there can be no doubt. It has led to very extensive operations for the removal of the primary disease, and consequently to a large death-rate. But it has frequently led to a percentage of success which I had not believed possible under the circumstances in which the operations were performed, and for all kinds of malignant disease. For the successful cases are composed of five cases of epithelioma (which I had regarded as almost hopeless from an operative point of view); three of glandular carcinoma; two of round-celled, and one of round- and spindle-celled sarcoma; one of endothelioma and four of giant-celled sarcoma. I have placed the giant-celled sarcomas last, because of the suspicion I have elsewhere expressed on the real nature of this disease. (See the sections on the Femur and Tibia.) The four cases all called for total resection of the upper jaw on account of the extent of the disease; the tumours which were cured by a partial operation were a round-celled sarcoma and an endothelioma. A study of the individual cases is rich in interest. In more than one of them the disease was so extensive that it

was regarded as hopeless; in two of them it was necessary to remove the eyeball; in one the skin of the face was involved and ulcerated; in several there was widespread ulceration within the mouth. On the other hand, there was no affection of the glands, or removal of them, in any of the successful cases. And only one operation for recurrent disease proved successful.

The duration of the carcinomas before operation, as it had been noticed by the patient, varied from a few weeks to six months—a short period, as malignant disease goes, in almost every instance. But, so far from improving the outlook from the operator's point of view, it rendered it less hopeful, for it showed what rapid progress the disease had made in so short a time. It is only reasonable to suppose that the disease had really been in existence for a much longer period than it had been observed, for the antrum may be full, especially of epithelioma, and the bone largely destroyed before any grave symptoms are apparent. The sarcomas had, for the most part, existed for a much longer period, even as long as years, a tribute to their less malignancy; although in one case, in which the disease is described as diffuse, it was very extensive and necessitated the removal of the eyeball within a few weeks of its appearance.

The Göttingen Klinik is very decided on the question of the relative advantage of total and partial excision of the upper jaw, especially for carcinoma. The entire upper jaw should be removed, although it is possible sometimes, in the case of sarcoma, to preserve a portion of the bone. This opinion is founded on the failure of the partial resections in every case of carcinoma, although the disease, at the time of the operation, appeared to be limited in extent, and to have been widely removed. Professor König is, therefore, very sure of the desirability of total resection. It must be remembered that we are not now discussing disease of the alveolar process of the upper jaw, but disease which occupies a large part of the bone. Attention will have to be directed to this point in all future operations on account of the great temptation there always is to preserve at least the orbital plate. Every surgeon knows how wide the difference is in the disfigurement caused by the total removal of the bone, and by the removal of the bone without the orbital plate; and how the sight of the eye is

often lost when it falls below its natural level after removal of the orbital plate. In the case of sarcoma of moderate proportions, an attempt may be made to preserve any portion of the bone which is not affected. In the case of giant-celled (myeloid) sarcoma, I am sure it is safe to go further than this. The disease is generally so comparatively innocent that the operation may be modified. It is now many years since I removed only the front wall of the antrum for a lady, who was suffering from a myeloid sarcoma, which lay between the two plates of the bones. It was the first, and I think it is the only specimen I have ever seen of undoubted origin of a tumour from the bony tissue between the outer and inner tables of the wall of the antrum- The patient remains well to the present day. This case and the general difference in the relative malignancy of sarcoma and carcinoma of the upper jaw make it very desirable that the diagnosis of the exact nature of the disease should be established before the operation. In many cases this can be easily accomplished, for there is ulceration within the mouth, or the tumour projects into the nostril. Thus, a sufficient fragment can be obtained of a very large number of the tumours for microscopic examination of sections. And for the boring epitheliomas it is quite easy to scrape some of the tumour out of the antrum through an opening which almost always passes into it from the alveolar process. Where the disease is not ulcerated, it is nevertheless often impossible to remove a small portion from the front beneath the cheek. where it commonly projects, without prejudicing the success of the operation.

In the case of malignant disease of the upper jaw, as in the case of malignant disease of so many parts of the body, I become more and more impressed with the certainty of the far better results which would be achieved by earlier operations. The operations would be less extensive, the danger of death would be smaller, the disfigurement much less, the prospect of cure much greater. But early operation implies early diagnosis, and there can be no doubt that the early diagnosis of malignant disease of the upper jaw often presents serious difficulty, even to experienced surgeons. Without entering on the details of diagnosis, which are beyond the scope of this work, it may be said that blood-stained discharge from one nostril, particularly if it be thin and watery and offensive, and there be some

obstruction to the passage of air, suggests malignant disease. That bulging of the palate, ulceration, severe toothache on one side, not relieved by the removal of the teeth, or followed by loosening of the teeth, and by slight swelling of the face, indicate epithelioma of the antrum. That swelling of the front of the antrum in persons over forty years of age often depends on the presence of a malignant new growth. And that the diagnosis can be made in many doubtful cases by the removal and examination of a small fragment of the disease.

The duration of the successful cases of carcinoma in Martens' paper was from five to eighteen years, and of the successful cases of sarcoma from three and a half to more than thirteen years. Six of the patients with carcinoma and four of those with sarcoma had lived free from recurrence of the disease for more than nine years after the operation.

Are patients who are not cured relieved by operation?—For the majority of patients on whom an unsuccessful operation has been practised, this question must be answered in the negative. The disease in almost all the unsuccessful cases returns *in situ*, and the recurrence is usually very speedy —within a few weeks or months of the operation. With the return of the growth there is almost always a return of the pain and distress which the operation was intended to relieve. In a certain few cases recurrence has been much longer deferred, and the patient has benefited by the comparatively long interval between the removal of the disease and its reappearance. As such cases are few in number and a long period of immunity from local recurrence cannot be expected, an operation which offers no reasonable prospect of preventing the recurrence of the disease *in situ* had better not be performed.

Conclusions.—Malignant disease of the upper jaw, whether sarcoma or carcinoma, appears to display its malignancy chiefly in the local destruction which it produces and in its great tendency to recur *in situ*. Affection of the lymphatic glands and dissemination in other parts of the body appear to be comparatively infrequent.

The giant-celled sarcomas (myeloid sarcomas) are much less malignant than the other varieties of sarcoma.

The giant-celled sarcomas may be successfully treated, when they are not very extensive, by partial removal of the upper jaw.

It is possible that partial excision may meet the case of other varieties of sarcoma, when the disease is of limited extent and circumscribed. Before this point can be definitely decided, a larger amount of evidence than now exists will have to be collected and analysed.

Total excision of the upper jaw is probably indicated for the removal of every variety of carcinoma. If the disease has extended beyond the limits of the bone, the surrounding structures must be removed as freely as it is possible to remove them.

The whole hope of an operation lies in preventing local recurrence of the disease, for it is extremely improbable that recurrent disease will be successfully removed.

Unless the lymphatic glands are obviously affected, it does not seem to be necessary or desirable to remove them as a precautionary measure. But attention will have to be directed to the question of affection of the lymphatic glands in the further history of patients who have recovered from removal of the upper jaw.

Fergusson's operation, or a modification of it, affords a better exposure of the field of operation than any other. If the skin is involved in the growth of the tumour, and a large area of it needs removal, the incisions may be modified to meet the special requirements of the case.

The mortality of excision of the upper jaw is still very high, especially when the surrounding parts are involved in the disease and require removal. The chief dangers are the loss of blood during the operation, and affections of the organs of respiration after it, especially septic affections.

There is now sound evidence that malignant disease of the upper jaw, of whatever variety, may be very successfully treated by operations of sufficient magnitude.

Much better results would certainly be obtained by much earlier diagnosis, and consequent treatment, of malignant disease of the upper jaw.

Appendix.—Since the preceding chapter was written, my dresser, Mr. Jennings, has collected and followed up the further history of all the cases in which I have removed the upper jaw for malignant disease at St. Bartholomew's Hospital. They are only fourteen in number, although they extend over many years, for it so happens I have not had an average even

of one case in the course of every year. But the results are better than I could have expected, and fully justify the more hopeful view which is expressed in this chapter.

Tabulated, they are as follows:

Died of the operation	4
Died of recurrence	5
Alive and well within three years	2
Alive and well more than three years	3
Total	14

I am, however, very doubtful whether one of the successful cases was really a case of malignant disease, and there are now no means of settling the question. This patient died of bronchitis sixteen years after the removal of the upper jaw. In both the other successful cases, the disease was epithelioma, and in both the orbital plate was left, yet one of the patients is alive and well at the end of ten years, the other after five years. The necessity of the removal of the orbital plate in every case of epithelioma is, therefore, still not clearly proved to my own mind. The more so because, nearly two years ago, I removed the upper jaw, with the exception of the orbital plate, for an epithelioma which had extended backwards into the spheno-maxillary fossa, and was ulcerated in the mouth. A month later, I removed the contents of the anterior triangle for glands of considerable size. I have lately seen this patient, and found him in exceedingly good health, and without any sign of recurrence of the disease. I trust the attention of operators will be particularly directed to this question, which can only be solved by careful notes of the condition of patients at the time of operation, and by following up the later history of the cases.

LOWER JAW

I am not aware of any work of importance which has appeared during the last ten or twelve years on the pathology or treatment of malignant tumours of the lower jaw. The subject is much in the same condition as when I left it in 1887, and I can only repeat the greater part of what I then said.

In the following pages I shall treat only of the sarcomatous

tumours of the lower jaw, not because the epithelial growths are not worthy of consideration, but because of certain difficulties in dealing with them. In the first place, many of the cystic tumours have been traced to an epithelial origin, and have on that account been named "epitheliomata," but they are apparently innocent rather than malignant in their nature, and owe their structure to tooth-remnants or to tissues associated with the process or disorders of dentition. The name "epithelioma," therefore, is unfortunate, because it is usually applied to tumours of a different structure and character. In the second place, true epitheliomata which have originated in the neighbouring parts, the floor of the mouth, the lip, &c., and have grown into the jaw, are often described as malignant disease of the lower jaw. Hence, confusion has arisen, and the material for the study of the course and treatment of the disease is restricted and difficult to reach.

The sarcomas of the lower jaw may be divided, like those of the long bones, into sarcomas of central and sub-periosteal origin. It is generally easy to determine the origin of the individual tumour, but sometimes the bone has been so destroyed by the time the disease is removed, that it is not possible to be sure whether the tumour has originated from the surface or from the interior of the bone.

The *sub-periosteal tumours* may be round-, spindle-, or mixed-celled, and are not uncommonly in larger or smaller part fibrified, chondrified, ossified, or calcified. In this respect they resemble the sub-periosteal sarcomas of other bones, and differ from the tumours of central origin. They may occur in children as well as adults, and appear to attack adults rather in the earlier than the later periods of life. They may affect any part of the bone, and may grow from the outer or the inner aspect, but grow from the body much more frequently than the ascending ramus, and often, in their growth, involve both aspects of the bone. They grow quickly, are not encapsuled, involve the muscles and other structures in the immediate vicinity of the bone, and sometimes attain considerable size. They are not associated with affection of the neighbouring lymphatic glands, unless they involve them in their continuous growth. After removal, they usually recur speedily, and with each recurrence are more difficult to remove. The course of the disease is almost always very rapid, and the patients die

from exhaustion due to the growth and ulceration of the recurrent tumours, or from secondary affection of other organs and tissues. Among the structures which are the seat of secondary growths are the lungs, the liver, distant and dissociated lymphatic glands, &c.

The *central tumours* may be round-, spindle-, mixed-, or giant-celled, but the giant-celled are of most frequent occurrence, for the lower jaw is a seat of election of this variety of sarcoma. Great differences are observable between the tumours of central and those of sub-periosteal origin. The central tumours are much less disposed to organisation and calcification. They may attack persons at any period of life, and may grow in the interior of any part of the bone, though almost invariably in the sides or front, not in the ascending ramus. But they usually grow slowly, so that they may occupy years instead of months in attaining a considerable size. They are, of course, contained within the bone until a large size has been attained, when they may make their way into the surrounding structures; but even then they do not exhibit the same tendency to infiltrate which is so notable a feature of the sub-periosteal tumours. They are rarely associated with affection of the neighbouring lymphatic glands or with secondary growths in other organs and tissues. With regard to the relative malignancy of the varieties of sarcoma, there can be no question that the myeloid or giant-celled is the least malignant.

The giant-celled sarcomas have sometimes been described as a disease of childhood or of very young adult life, but I cannot find in a collection of actual cases a confirmation of this view, and should myself say that they occur more commonly in persons in the middle period of life than earlier.

Occasionally, cysts are found in the sarcomas of central origin; in fact, some of the large multilocular cystic tumours are sarcomas. But the great majority of these tumours are structurally not sarcomatous, and are clinically innocent.

Methods of Operation.—For tumours of sub-periosteal origin there is only one method of treatment which should be employed: resection of the affected portion of the bone and removal of as much of the surrounding soft parts as ought to be and can be safely removed. In this way, and only in this way, is there any prospect of preventing the local recurrence of

a disease which is peculiarly marked by the tendency to recur *in situ*.

But for tumours of central origin it may suffice, in many instances, in the first removals at least, to gouge or scrape the tumour out of the interior of the bone, reserving the more formidable proceeding for recurrent disease or for tumours which are of great size and formidable aspect.

In the descriptions of the various operations I shall avail myself largely of Mr. Heath's work, "Injuries and Diseases of the Jaws," 1884, not only on account of the large personal experience he has had, but because he has embodied with his own the experience of other surgeons whose names have been associated with the removal of the lower jaw.

A small tumour seated in the interior of the jaw towards the front part of the bone may be removed by the following method:—Chloroform having been administered, and the mouth thoroughly opened by means of a gag or the dentist's vulcanite prop inserted on the side opposite to the tumour, the mucous membrane and soft parts are separated from the bone where the growth is most prominent or the bony wall is thinnest. A sufficiently large opening is made into the cavity by cutting away the wall, and the tumour is shelled or gouged out of the interior of the jaw. In some instances the cavity in which it lies is perfectly smooth-walled, and the removal of the growth is effected in a few moments; in other cases it must be carefully scraped out. When the opening is made on the outer aspect of the bone, it is necessary to separate the structures of the cheek widely from it, in order to gain free access to the disease and to arrest the bleeding. It must not be forgotten that when the tumour is seated far back in the body of the jaw there is danger of wounding the facial artery. To avoid this accident, which might prove serious, it is necessary to keep close to the bone, and better to use a bone elevator than a sharp instrument in raising the soft structures off the surface of the jaw. After the thorough removal of the disease the cavity is sponged out, bleeding arrested, and the interior dusted with iodoform or plugged with iodoform gauze. During the healing, iodoform is used once or twice every day, or the gauze is changed, and the mouth is kept clean by means of antiseptic washes.

Resection of the affected portion of the bone, when the

disease is situated towards the front and is of small extent, is a simple operation, but in performing it one or two points should be taken into account. An anæsthetic is administered (usually chloroform), and the mouth is held open by a gag or prop; the cheek is held down and away from the tumour with a retractor, so as to obtain the best light and exposure possible, for it is not necessary to divide the external parts. If the tumour is central, the soft parts are raised off the surface of the bone. A tooth is removed at each end of the tumour, the bone is divided through the sockets, either with bone-forceps or a small saw, and the piece of bone including the disease is taken out. The bleeding is easily checked by the cautery, by pressure, or the application of cold water, and perhaps one or more small vessels may need to be tied in the divided soft parts. The surface of the wound is dusted over with iodoform and this is the only dressing which is likely to be required during the healing. The points which must be borne in mind are these—the relation of the facial artery to the disease, which will, of course, in the large majority of cases to which this operation is applicable, be at some distance behind; and the possibility of preserving the lower line of the jaw undivided. In cases in which it is of great importance to operate wide of the disease, the preservation of the line of the jaw must be a secondary consideration; but in cases in which the disease is central and does not reach to the lower line of the bone, it is not necessary to completely divide the bone. In such cases a horizontal incision is made with a fine saw between the lower margin of the tumour and the lower margin of the jaw.

When the disease is of large extent, it is necessary to remove one-half of the bone, and, for this purpose, to incise the external parts. For, although it has been found possible to remove one-half of the bone through the open mouth, there is so much difficulty in doing so, and so much danger from hæmorrhage, that the intention of avoiding an external scar is not justified. Even in the removal of innocent tumours this proceeding is rarely safe; it is much less applicable to malignant tumours. An incision is made along the posterior border of the bone or tumour from the level of the lobule of the ear to the median line, and, if needful, on account of the large size of the tumour, a vertical incision may be carried through the lip. The facial artery is tied and the soft tissues

are raised. A tooth is extracted in front of the tumour, and, through the socket, the bone is divided with a saw or large pair of bone-forceps. The affected half is drawn outwards with the lion-forceps, and the tissues are divided close to it on the inner side. In order to free the coronoid process, the jaw is drawn forcibly downwards. The internal maxillary artery and the facial nerve are avoided by keeping close to the inner and outer surfaces of the ramus of the jaw. After the coronoid process has been freed, the joint comes into view, is opened in front, the condyle dislocated, the knife carried cautiously behind it, and the bone finally removed by wrenching through the remaining fibres of the external pterygoid muscle. For the safer conduct of the later steps of the operation, a flat bone-elevator may be employed instead of the knife; there is then less danger of wounding the maxillary artery.

When the tumour is very large, a vertical incision through the lip is very desirable, in order to allow of a thorough exposure of the disease; and, as the large size of the growth may hinder the dislocation of the condyle and the freeing of the coronoid process, Mr. Heath recommends the division of the process with bone-forceps, and to remove as much of the disease as possible below the joint, clearing out the remainder and the condyle when the main mass of the tumour has been removed.

Again, when the tumour has extended so far round the front of the bone as to necessitate the removal of the symphysis, there is a danger that the tongue may fall back during and after the operation, and suffocate the patient. To avoid this accident, a thread should be passed through the tip of the tongue with which to draw it forward.

During the whole of the operation it is the duty of the assistants to keep the mouth clear of blood and to prevent the blood finding its way into the trachea and lungs. Vessels should be tied or clamped as soon as they are divided; and, when the disease has been removed, the wound must be as quickly as possible cleansed, and bleeding points secured. The surface may then be covered with iodoform powder, or plugged with gauze.

After the operation, it is not usually necessary to feed the patient through a tube. But, if the parts removed are very extensive, and the patient's condition is seriously affected by

the long duration of the disease or the severity of the operation it is well to administer at least one such feed in the course of the day. And if there is serious difficulty in swallowing, the food should be entirely administered through a tube. Mr. Heath suggests that, when the effects of the iodoform have worn off, other antiseptics should be employed. I prefer, however, for all wounds of the interior of the mouth, whether they involve the bone or not, the application of iodoform powder, which can be made once or twice a day, or more frequently if requisite, by means of an insufflator. I am aware that it is possible to produce iodoform poisoning, but I have scarcely ever seen a case, although I have, during many years, been in the habit of using powdered iodoform very freely in the mouth.

Results of Operations.—*Deaths due to Operation.*—In dealing with this question, a similar difficulty is encountered to that which is met with in dealing with operations for cancer of the tongue. The size and situation of the tumours vary so much, to say nothing of the age and personal condition of the patients, that a very wide difference exists between the operations which are practised. I am not speaking of the mere scooping of a central tumour out of its cavity, but of actual resection of the portion of bone on or in the interior of which it grows. I think our purpose will be best served by taking all the cases of resection together, without attempting to group them according to the extent or situation of the bone resected. In this portion of the subject, the central and sub-periosteal tumours may be grouped together. I have myself collected accounts of sixty cases of sarcoma of the lower jaw, from various sources, in all of which the operation of resection was practised either at first, or for recurrence of the disease after it had been previously removed by a less severe proceeding. The total number of deaths due to the operation was eight. Lücke in (Langenbeck's *Archiv*, iii. 291, 1862) gives statistics of the removal of one-half of the jaw in seventeen instances, and four of the patients died of the operation. Heath says that Cusack of Dublin operated in seven cases, with one death; and that Dupuytren operated in twenty cases, with only one death due to the operation. The total number of cases is therefore 104, with fourteen deaths due to the operation, a mortality of rather less that fourteen per cent.

The cause of death is not mentioned in Dupuytren's fatal case. But in the other thirteen cases it was as follows:—

Exhaustion	5
Anæmia and exhaustion	1
Aortic stenosis (old)	1
Pneumonia	2
Gangrene of lung	1
Pyæmia	1
Erysipelas and meningitis	1
Erysipelas and œdema glottidis	1
Total	13

In round numbers, it appears that half of the deaths were due to exhaustion, the other half to general or pulmonary sepsis. Probably loss of blood was the chief cause of the large mortality which is attributed to exhaustion.

I do not know how an equal number of cases of operation performed during the last ten years would compare with this series. The difficulty of collecting cases is very considerable. Malignant disease of the lower jaw is very uncommon. Mr. Henshaw looked out the cases which had been treated at St. Bartholomew's Hospital between the years 1887 and 1897, inclusive, and they amounted only to ten, in six of which the tumour is stated to have been "removed," and in four a part of the lower jaw excised. None of the cases of "removal" of the tumour proved fatal, but one of the patients who suffered resection of the bone died of the operation. I believe, if a large number of recent cases were put together for analysis, the mortality would not be so large as it was in the hundred cases I have collected, and that the deaths would be found to be due to shock and exhaustion on the one hand, and to septic affections of the lungs on the other hand. I am led to form this opinion not from mere theoretical considerations, but from a study of the causes of death in the operations on the upper jaw. The deaths from general sepsis have been much diminished in connection with operations in the mouth, although these wounds cannot be kept aseptic. But the large operations which are now so frequently performed naturally yield a large rate of mortality; and are dangerous, particularly from the severity of the operation, and from poisoning through the air-passages.

In order to diminish the percentage of fatal cases, I would suggest similar measures both during and after the operation to those recommended in the sections on the Tongue, Tonsil, Upper Jaw, &c. The lateral posture during the operation; the clamping of vessels as, or even before, they are divided; the plugging of the wound, if it is large, or there is much oozing of blood, with iodoform gauze; and, in addition, very free drainage of the wound from below, with frequent change of dressings and washing out of the discharges. If there is any difficulty in taking food, it should be regularly administered, during the first few days, through a tube.

Cures due to Operation.—I have collected notes of nineteen cases of sub-periosteal sarcoma and of forty-three cases of central sarcoma. The disproportion in the numbers of the tumours of central and sub-periosteal origin will at once strike the reader: it results from the fact that central tumours are really more numerous than sub-periosteal tumours of the lower jaw, not from mere chance in the collection. The great liability of the jaw to myeloid or giant-celled sarcoma alone accounts for the disproportion, for the number of these tumours as nearly as possible corresponds with the difference.

The nineteen cases of sub-periosteal sarcoma give the following results:—The operation of resection of the portion of the bone bearing the tumour was practised in every instance. There was no death from the operation. Eight of the patients were dead or dying of recurrence, and the recurrence was in almost every instance very rapid, so that not one of these patients was alive twelve months after the operation. One patient died of secondary disease in the mediastinal glands, the orbits, trunk, scalp, and interior of the abdomen at the end of four months and a half; but the account leaves it uncertain whether or not there was also local recurrence of the maxillary tumour. One died of pneumonia at the end of two months, but apparently without any local recurrence of the disease. Eight were lost sight of as soon as they left the care of the operating surgeon; and one patient was alive and well at the end of two years and a half after the operation. The results are certainly distressingly unsatisfactory. In the cases in which a microscopical examination was made, the tumours were nearly all round- or spindle-celled. The instance in which the operation was successful was that of a coloured boy,

twelve years old, whose tumour—a round-celled sarcoma—was removed by Dr. Mears (Philadelphia). It grew from the body of the bone on the left side, and had already, at the end of three months, infiltrated the masseter muscle. There was no affection of the lymphatic glands. The disease was freely cut out with the surface of bone from which it grew, but I am not sure from the description whether the entire thickness of the bone was cut away or whether the operation was limited to the removal of the surface which bore the tumour. The boy made a good recovery, and was quite well at the end of two and a half years.

In three of the instances in which recurrence of the disease took place a second operation was performed, but in not one of the three was it attended with success, for a second recurrence appeared even more quickly than the first had done, and rapidly proved fatal.

The statistics of the central tumours offer an agreeable contrast to those of the sub-periosteal, although a very large mortality due to the operation must be deplored, and a large number of the patients were lost sight of after their recovery. Eight of the forty-three patients died of causes connected with the operation, in nearly every instance of exhaustion due to its severity and to the previous ill-condition of the patient. Two died of recurrence of the disease, and in one of these cases, recorded in Heath's "Diseases of the Jaws," repeated attempts were made to remove the disease and the recurrent tumours. But finally the patient died, partly on account of the recurrent tumour, partly because secondary growths formed in the humerus and pelvis. In the other of these two cases, also taken from Mr. Heath's work, I am disposed to doubt whether the disease was really of central origin. The tumour was mixed-celled, grew from the body of the jaw of a little girl five years of age, had only been noticed two months when the first operation was performed, recurred very quickly after removal, was again removed and again recurred, and proved fatal within seven months of its first appearance. No examination of the body was made. Mr. Heath says the disease was clearly of central origin, but the description of the tumour and its relation to the bone does not give this impression, while the course of the disease was in the highest degree characteristic of sub-periosteal, not of central disease. No fewer than twenty

of the forty-three patients were lost sight of after the operation; and thirteen patients were known to be alive and well at periods respectively of "some months" (two), five months, eight months, ten months, twelve months, seventeen months, two years, two years and a quarter, three years, three years and a quarter (two), and between five and six years.

There are therefore four instances in which the patients can be claimed, on the three-years' limit, to have been permanently relieved by operation, a proportion of as nearly as possible one in six when the cases which were lost sight of are left out of consideration. In addition, several patients were quite well and free from disease at periods of from one to three years after the removal of the disease.

The study of the successful cases teaches that in the four wholly successful the tumour was in two of them giant-celled, in one spindle-celled (fibro-plastic), and in one a fibrifying sarcoma. In most of the cases which may be regarded as partially successful the disease was giant-celled (myeloid). There is not one instance in which an operation of less magnitude than resection of the portion of bone containing the tumour was wholly successful, but there is one in which a myeloid sarcoma was enucleated from the cavity in which it lay, and the patient was alive and well two years after the operation. There is also an instance in which mere removal of the tumour was followed by recurrence, the recurrent disease was resected, and the patient was well some months later. And there is still another in which a fibrifying spindle-celled sarcoma, containing calcareous particles, was shelled easily out of its cavity in the interior of the body of the jaw. It soon began slowly to form again, and at the end of seven years, when it was still of small size, the portion of the bone containing it was resected. I can give no further account of the case than that the patient made a good recovery from the second operation. It is, however, a case well worth bearing in mind, for the small size and structure of the tumour, together with the absence of any adhesion between it and the perfectly smooth-walled cavity in which it lay, gave every reason to hope that enucleation would suffice for the complete cure of the disease. But the recurrent tumour was intimately blended with the bone, and it would have been impossible to enucleate it even had the surgeon (Mr. Holden) been disposed to attempt

it. In the most successful cases, the growth of the tumour had been observed for from eight to thirty months before an attempt was made to remove it; in other cases, particularly those in which the tumour was myeloid, the disease had existed for several years before an operation was performed: in one of these the patient was alive and free from disease a year and a half after the operation.

In several of the cases in which the patients were lost sight of, the operation was not the first to which they had been subjected. One example of such a case has just been mentioned, and there are, at least, three others in which resection of the tumour and the bone in which it grew was followed by recurrence and by a second operation, but the later history of the patients is not recorded.

Are patients who are not cured relieved by operation?—To this, as a general proposition, the answer will certainly be, Yes. Provided there is no local recurrence of the disease, or during the interval between the operation and the recurrence *in situ*, the patient, in the very large majority of instances, is decidedly relieved by the operation. Recurrent disease may, of course, produce the same or even greater discomfort than the original tumour. And if there is only a small prospect of so completely removing it as to ensure against immediate recurrence, it is scarcely reasonable to subject a patient to an operation in the least degree severe.

It is, moreover, necessary to consider the effect on the individual of the removal of a large fragment of the lower jaw. It may well be imagined that deformity may result from the loss of so important a part of the bony framework of the lower part of the face, and also that difficulty may ensue in the act of mastication. Fortunately, as Mr. Heath has pointed out, these troubles are far less felt than might have been believed on theory. Firm fibrous tissue takes the place of the bone which has been removed, and a plate of teeth can be so well fixed to this that the outline of the jaw is preserved. The muscles, too, become attached to the fibrous medium, so that the movements of the jaw can be perfectly performed. Some skill and, still more, patience on the part of the dental surgeon will generally suffice to make the patient not only quite comfortable, but perfectly presentable.

Conclusions.—So far as can be judged from the somewhat

scanty material at our disposal, the following conclusions may be drawn:

For sub-periosteal sarcomas, the only operative treatment which holds out any prospect of success is resection of the part of the bone bearing the disease, with free removal of the surrounding apparently healthy structures.

For central sarcomas, resection of the affected part of the bone, which may be performed from within the mouth, if the disease is seated in front and is of small extent.

If the central sarcoma is giant-celled—a typical myeloid tumour—it may be scooped out of the cavity in which it lies.

Recurrent disease, both sub-periosteal and central, should be treated by free resection of the bone, so long as it is within the reach of removal, even by a very extensive operation.

CHAPTER XIII

TONGUE

In spite of Targett's paper (*Guy's Hospital Reports*, 1890, p. 21) and of Marion's paper (*Revue de Chirurgie*, xvii. 192, 1897), the number of cases of sarcoma is still too few to allow of a general description of the disease. Marion has, with great labour, put together a series of twenty-four cases, collected from various sources; but the first of them is a case of undoubted epithelioma, as an examination of the original account of the case and the sketch of the microscopic constituents of the tumour will convince any person who studies them (*Pathological Transactions*, xx. 137). Probably some of the other cases are not really cases of sarcoma.

Nevertheless, it is quite clear, as Marion justly remarks, that there is such a disease as sarcoma of the tongue; that it may appear in one of two forms, either as an encapsuled interstitial tumour or as a prominent pedunculated mass; and that it may consist of round or spindle cells. It may attain a considerable size in a short time; in the only case which has been under my care, the tumour was as large as an egg two months after it had been first observed. It may remain for a long time limited to the tongue, or may affect the neighbouring lymphatic glands. And, in a few cases, secondary tumours have been observed in the integument of distant parts of the body. Local recurrence after removal has been several times noted. On the other hand, free operation, including not only the removal of the tumour, but of the apparently healthy structures around it, has proved quite successful in the treatment of the disease. In my own case, the half of the tongue which contained the large tumour was removed, and with such success, that there was no recurrence of the disease between three and four years after the operation.

Only one variety of carcinoma appears to affect the tongue

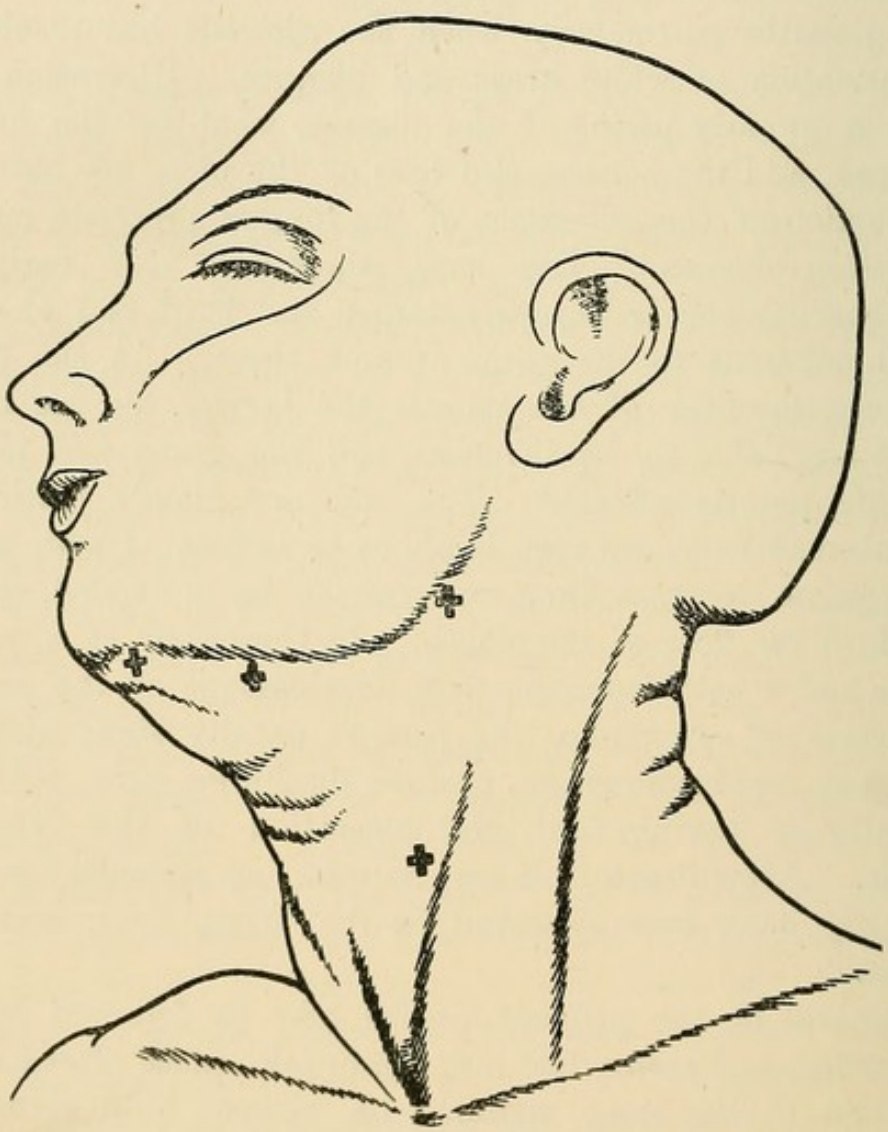
—the squamous-celled or epithelioma. It may occur on any part of the organ—tip, dorsum, border, and as far back as the epiglottis, but is more common towards the front; attacks men far more frequently than women; is a disease of adult age, rarely appearing in persons under thirty years; and commences now in the form of a wart, now in the form of a chronic ulcer, or a fissure, or a nodule. But it commences far more frequently in the form of a wart, or warty growth, and, above all, in tongues which are the seat of chronic superficial glossitis, particularly when the glossitis has resulted in the formation of white areas and plaques. Ulceration takes place at an early period of the disease, whatever the form of outbreak, and the borders and base of the ulcer are indurated. Destruction of the substance of the tongue proceeds, and the induration deepens. Ere long, sometimes very early, the neighbouring glands become enlarged and hard, and at a later period adherent to the parts around them. As the disease advances, the floor of the mouth, the larynx, the palate and tonsils are liable to be involved, and the gums and jaw are not infrequently affected. The salivary glands, particularly the sub-maxillary, are very liable to be infiltrated with cancer. The tongue becomes fixed and cannot be protruded, or even raised off the floor of the mouth. In the course of a year or a year and a half from the first development of the essential characters of carcinoma, the patient usually sinks and dies, worn out by hæmorrhage, profuse discharge, pain, salivation, difficulty of taking food, and ulceration of the lymphatic glands. After death it is very rare to find secondary growths, but they have been observed in the lungs, liver, and other organs.

Removal of the primary disease may be followed by local recurrence, and recurrence may again take place after a second operation in the same manner; or, without local recurrence, the glands may become affected, and by their enlargement and ulceration may prove fatal.

For the purposes of surgery it is important to keep constantly in mind that carcinoma of the tongue is essentially a local disease, limited to the tongue and the parts adjacent, and to the lymphatic glands of the neck. Theoretically, if the primary disease within the mouth could be removed with a wide area of the surrounding healthy structures, and all the

glands liable to be affected could be taken away, carcinoma of the tongue would be remarkably amenable to surgery, and operations would offer admirable results. Unhappily, the disease has often made very extensive progress within the mouth before the patient comes to the surgeon, the floor of the mouth is already affected, and the primary disease is scarcely within the reach of surgery. Equally unhappily,

FIG. 4



there is not the same order of occurrence in the glandular disease secondary to carcinoma of the tongue as is observed in the glandular disease associated with cancer of some other parts of the body—the breast for instance. With a small carcinoma limited to one border of the tongue, there may occur glandular disease in several different situations on the same side of the neck, and even the corresponding glands on

the opposite side of the neck may be affected, so free does the lymphatic anastomosis appear to be between the two halves of the tongue in some individuals.

In the large majority of cases, however, the following course and order is observed in the affection of the lymphatic glands. One or more of four groups of glands on the same side as the carcinoma are liable to be affected: (i) the sub-mental, in the floor of the mouth, behind the lower jaw; (ii) the sub-maxillary; (iii) the carotid, at and about the bifurcation of the common carotid artery, and (iv) the parotid, situated at and about the angle of the jaw. One or more of the sub-maxillary lymphatic glands is frequently imbedded in the substance of the salivary gland. The same may be true of the parotid glands, but I cannot speak certainly on this point. Of these four groups, the sub-maxillary and carotid are the most likely to be affected in all cases. But when the disease is situated near the tip, the sub-mental glands may also be diseased; and when it is far back towards the root of the tongue, the parotid group of glands is likely to become cancerous.

Contrary to what occurs in association with cancer of the breast, the lymphatics between the glands and the primary disease do not appear usually to contain cancer-emboli. Heidenhain thinks this is common to the squamous-celled carcinomas of all parts of the body, and is not peculiar to cancer of the tongue.

Methods of Operation.—To give a detailed account of the many methods which have been designed for the removal of part or the whole of the tongue would occupy more space than can reasonably be devoted to the subject in a single chapter. I shall, therefore, be content with giving a description of the methods which are usually adopted in this country and must refer the reader to my book on "Diseases of the Tongue" for an account of the manner of performing some of the less common operations.

Caustics are rarely employed for the removal of actually developed cancer of the tongue, but the acid nitrate of mercury and nitric acid are occasionally used for the destruction of some of the pre-cancerous conditions. Personally, I very much prefer the knife or scissors, because they can be directed with much greater precision.

In all the larger operations on the tongue an anæsthetic should be administered, the mouth should be opened by means of a strong gag, the tongue drawn well forward by threads introduced through the tip, and the best possible light should be obtained. On the side opposite to that on which the gag is placed, a large plated or copper retractor should be used to hold back the cheek. With such an excellent exposure, and such a command over the tongue, there is little difficulty or danger in removing the tip, or much further back than the tip. The mucous membrane is divided in the middle line on both the dorsal and under aspects of the organ, and the two halves can then be easily separated with the fingers, in fact torn apart. Each half may be removed separately with scissors, from below upwards. The artery will be found near the middle line on each side; may be distinguished by its bluish colour in the muscle before it is divided, clamped, and tied or twisted according to the usual practice of the operator.

Whitehead's operation for the removal of one-half or the whole of the tongue is very commonly practised in this country, and has been my stock operation for the past ten or more years. I believe it to be a safe and good operation for the removal of the tongue through the mouth, but it is important that it should be carefully carried out in the manner described by Mr. Whitehead. The steps of the operation are as follow: The mouth is opened to the full extent with a gag, the duty of attending to this important part of the operation being entrusted to one of the two assistants required. The tongue is drawn out of the mouth by a double ligature passed through its substance an inch from the tip. This ligature is given in charge of the second assistant with instructions to maintain throughout the operation a steady traction outwards and upwards.

The operator commences by dividing all the attachments of the tongue to the jaw and to the pillars of the fauces with an ordinary pair of straight scissors.

The muscles attached to the base of the tongue are then rapidly cut across with the scissors until the entire tongue is separated on the plane of the inferior border of the lower jaw, and as far back as the safety of the epiglottis will allow.

The lingual and other arteries requiring torsion or ligature are distinguished without difficulty before they are divided, and are seized with clamp forceps so that the bleeding during the operation is reduced to a minimum. A single loop of silk is passed by a long needle through the remains of the glosso-epiglottidean fold of mucous membrane, as a means of drawing forward the floor of the mouth should secondary hæmorrhage take place. This ligature may with safety be removed the day after the operation; and as it is a source of annoyance to the patient, it is always desirable to adopt this rule.

In order to reduce the liability of blood entering the air-passages during the performance of the operation, Whitehead places his patient in a semi-sitting position on the operating table, has the head held by an assistant in such a manner that it is about on a level with the axilla of the surgeon, and prevents him slipping down on the table by placing the knees over a double-inclined plane.

For my own part, on many occasions lately, I have placed the patient on his side, with the head a little forward and downward, so that the blood runs naturally into the cheek and out of the mouth, and practically none passes down the throat. This is a posture which I have employed for many years in operating for adenoid vegetations, so that I have become accustomed to it. I prefer to sit in front of the patient, and to use instead of daylight (during the later steps of the operation, at least) the light of a lamp reflected into the mouth by means of the ordinary laryngeal reflector, which I wear upon my head.

Mr. Whitehead, after arresting the hæmorrhage from the principal arteries, swabs the surface of the wound with $\frac{1}{1000}$th biniodide of mercury solution, then paints it over with a varnish made by substituting for the spirit ordinarily used in the preparation of friar's balsam a saturated solution of iodoform made by dissolving it in ether mixed with one volume in ten of turpentine. I more commonly employ powdered iodoform, or pack the surface of the wound with strips of the softest iodoform gauze, which, like the iodoform varnish, has the effect of rapidly stilling the oozing of blood.

I further order that the patient shall lie well over on the side after he has recovered from the anæsthetic, with only a

single flat pillow for the head, and with the head forwards, so that all discharges have a tendency to escape from the mouth, rather than to pass down the air-passages. During the first one or two days, in a bad case, the patient is generally nourished by means of enemata. At the end of thirty-six or forty-eight hours, if there is likely to be difficulty in taking food in the ordinary way through a feeder furnished with a long nozzle of india-rubber, he is fed two or three times a day through a funnel, tube, and catheter, which can be passed quite easily on almost all patients by a good nurse.

If there is more oozing from the surface of the wound than usual or desirable, and it is not arrested either by means of the varnish or the packing with gauze, the surfaces of the wound may be fastened together by two or three silk or stout catgut sutures, which affords a very easy method of arresting the bleeding, but I am not in the habit of generally attempting to close the wound. Indeed, this is rarely possible in cases in which the entire tongue has been removed.

The écraseur and galvano-cautery have been so little employed in the removal of the tongue since the last edition of this work was published, that it is not now necessary to describe the manner in which they are used.

More room can be obtained in bad cases by splitting the cheek from the angle of the mouth back to the anterior border of the masseter muscle, but this procedure is, I believe, much less frequently used than formerly.

The intra-buccal operation is, of course, much more difficult and much more dangerous if the floor of the mouth is deeply affected, or if the tongue is fixed to the tonsillar region or to the jaw, and it is sometimes necessary to replace it or to supplement it by some means. In cases in which there is affection of the glands, the operation is often performed through a sufficiently large opening in the neck, when the glands are removed and the lingual artery tied before the removal of one-half or the whole of the tongue, which may be drawn out through the floor of the mouth into the wound. For this purpose, the incision recommended by Kocher is very popular in this country, and is often spoken of as Kocher's operation, although it is in reality only a very small part of the operation designed by Kocher, who performed a preliminary tracheotomy so as to take the breathing away from the mouth

and nose, removed the tongue and glands through his incision in the side of the neck, then packed the naso-pharynx, pharynx, and cavity of the mouth with iodoform gauze, which he changed twice in the day, when opportunity was taken to feed the patient by means of a tube and funnel. This operation was the first, and, I think, the only attempt to apply the Listerian methods to the removal of the tongue. It has never gained much favour, except in so far as the incision and method of drawing out the tongue through the wound are concerned.

For disease of the tongue situated far back on one side, and implicating the tonsillar region, v. Langenbeck's operation appears to be largely employed on the Continent. Shortly, it consists in making a very free opening on the side of the neck, and over the lower jaw, dividing the jaw about the level of the last molar tooth, turning back the two portions of the divided bone, and thus obtaining a very free and good exposure of the field of the operation. Of course, in cases in which the jaw is involved, such an operation as this, modified to meet the situation of the disease, may be very successfully applied, and the affected portion of the bone may be removed. But it must always be borne in mind that the disease is comparatively little prone to recur in the bone. It is in the soft parts over and about the bone that recurrence is most likely to take place.

On several matters which have been much before my mind for several years, I am now able to formulate my opinions more definitely. I will put them in the form of questions, and the first shall be:

Is it necessary to remove the entire tongue in every case of cancer?—Decidedly not. The aim of the operator should be to remove the cancer with three-quarters of an inch of apparently healthy tissues around it in every direction. Where the disease is on the border of the tongue, the best practice is to remove that half of the tongue to an inch behind the margin of the disease. And when it is near the tip or fore-part of the dorsum, the fore-part of the tongue should be removed.

Is it desirable or necessary to ligature the lingual artery or arteries before removal of the tongue?—In reply to this, my answer is that, if it is found desirable to operate from the outside for any other cause, the ligature of the lingual artery is desirable, as it facilitates the removal of the diseased portion

of the tongue. And I would recommend, as the best situation for the application of the ligature, not the dissecting-room spot, but the artery just after it is given off from the external carotid, as was suggested to me by Mr. William Anderson. I have never been in the habit of opening the neck simply for the purpose of ligaturing the lingual artery.

Is a preliminary tracheotomy desirable?—In answer to this question, I have never performed, so far as I can recollect, preliminary tracheotomy, unless there was some other special reason for doing so. I do not think the extra wound is without danger, and I feel sure the patient finds it much more difficult to rid himself of unwholesome discharges in the trachea and to feed after tracheotomy has been performed. In cancer of the floor of the mouth in front, when the operation is performed from below, and the attachments of the jaw to the hyoid bone have been divided, tracheotomy is, I think, desirable.

Should a routine operation be performed for the removal of the lymphatic glands?—For some time past I have been in the habit of strongly recommending my patients to submit to such an operation, on account of the frequency with which successful cases of removal of a part or the whole of the tongue are spoiled by subsequent affection of glands which could not be distinguished by the most careful and methodical search at the time of removal of the cancer of the tongue. In the very large majority of cases, the affection is, for a long time at least, limited to the glands on the same side of the neck as the disease, and the sub-maxillary and carotid groups of glands are chiefly or only affected. When the disease is far forward, the sub-mental glands are liable to be cancerous, and when it is far back in the mouth, the parotid group is more decidedly exposed. The removal of the contents of the anterior triangle of the neck, including the sub-maxillary salivary gland, will take in the four groups of glands which are affected in the very large majority of cases of cancer of one-half of the tongue. I have been in the habit of performing this operation by making an incision about seven inches long on the anterior border of the sterno-mastoid muscle from the mastoid process to well below the cricoid cartilage, and a second incision from the symphysis of the lower jaw to the first incision about the upper level of the thyroid cartilage, and raising up the two

triangular flaps which are thus mapped out. The dissection is commenced from the apex of the triangle below, and carried upwards. The large vessels are exposed for a considerable distance, and an enlarged gland, perhaps not yet cancerous, is almost invariably found actually upon the carotid sheath over the bulbous bifurcation of the artery. The vessels which are cut are clamped before, or as they are divided; and, finally, the sub-maxillary salivary gland is taken out. A very careful dissection is made of the triangle, so that the connective-tissue and glands are taken out in one continuous mass. Search is made between the muscles in front for one or two deeper-seated lymphatic glands, and the glands in front of the parotid and about the angle of the jaw are removed with the other contents of the triangle. The sub-mental and parotid glands are not so easily and certainly removed *en masse* as the sub-maxillary and carotid groups. Both the latter groups are very readily removed and require no special search to be made for them.

The wound should be drained at the lowest part, because it is very liable to become septic from the mouth, even when there is no obvious opening into it.

At first, I was in the habit of performing this operation at the same time as I operated on the disease in the mouth. But experience taught me that this is too hazardous. The loss of blood is always considerable, in spite of the care taken to clamp and ligature the vessels as they are divided. It is far safer to remove the disease of the tongue first. And when the patient has had time (perhaps three weeks) to recover from this operation, and can take food well, the removal of the contents of the anterior triangle may be undertaken without fear.

Many times, in the course of this operation, I have discovered enlarged glands, which I had not been able to detect until the neck was opened. And, in more than one instance, I have removed typical cancerous glands, which were so deeply placed and hidden that their existence had not been suspected.

In the treatment of carcinoma of the floor of the mouth, in the middle line, under the tip, I have modified this proceeding, to take in the sub-maxillary glands, the carotid glands, and the sub-mental glands on both sides, and have generally removed the disease from the mouth at the same time. The disease of

the floor of the mouth can be removed by this means with a freedom and certainty which is not afforded by any other method, for the tongue is brought down through the opening, so that the disease is thoroughly exposed. The operation is the old Regnoli or Sédillot operation, extended downwards and to the sides for the removal of the glandular structures. It has, however, this disadvantage, that it necessitates the division of the genio-hyoid and genio-hyo-glossi muscles for its perfect performance, and the division of these attachments of the hyoid bone to the symphysis of the lower jaw is attended with dyspnœa from the falling downwards of the larynx. At the close of the operation the genio-hyoid muscles are sutured, and the dyspnœa ceases, but the possibility of subsequent yielding of the sutures and consequent suffocation a few days after the operation, has suggested to me the desirability of providing against such an accident by tracheotomy, or a modification of the procedure by division of the symphysis of the jaw and drawing down the tongue between the muscles in place of dividing them.

Results of Operations.—*Mortality due to Operations.*—Mr. Whitehead complains (*British Medical Journal*, 1891, i. 961), that I did not treat his statistics fairly in a former edition because I did not separate the various operations with regard to their relative mortality. I treated Mr. Whitehead's statistics as I treated those of other surgeons, and as I have since treated my own, merely taking the total number of operations performed and the number of cases fatal from the operation. I am afraid that, for the tongue, there is no better means, for the relative danger of operations is not comprised in the mere difference in the danger of removing the whole of the tongue or a part of the tongue. Every surgeon of experience in operations on the mouth and tongue knows perfectly well that the uncomplicated removal of the whole tongue is far less dangerous than the removal of half the tongue, with a large dissection of the glands on the same side of the neck. And there are few surgeons who would not rather perform the removal of the whole tongue, than take out half the tongue with a deep rooting-out of the structures on the same side in the floor of the mouth. In fact, there is no just standard for measuring the relative difficulty and danger of operations for the removal of cancer of the tongue. So far as the operator

is concerned, no injustice is done by the method of calculation which has been adopted by Mr. Barker and myself, the method mentioned above of comparing the total number of deaths with the total number of operations. For instance, while Mr. Whitehead has just reason to be proud of his success in uncomplicated removal of the whole or a part of the tongue (101 cases with three deaths), the mortality of his complicated operations is very heavy, amounting to 17 deaths in 38 cases, the mortality under one heading alone ("excisions below the jaw") being 7 deaths in 9 cases. Mr. Whitehead's statistics furnish 139 operations (? patients) with 20 deaths, giving a death-ratio of 14·3 per cent. Seeing that some of these operations date back more than twenty years, when the death-rate of operations was very much larger than it is at present, the general result is exceedingly good.

In 1887 I pointed out that the mortality of operations for cancer of the tongue had been growing less for some time previously, and expressed the opinion that further improvements in the after treatment of the cases would lead to a still smaller death-rate. This forecast is certainly justified by some of the statistics which have been published during the last few years. Take, for instance, the statistics of four operators, each of whom has published the results of more than thirty cases of removal of cancer of the tongue: 33 cases by Krönlein of Zürich (Carl Binder, *Beiträge z. klin. Chir.* 1896, xvii. 253); 59 cases by Kocher of Bern (W. Sachs, Langenbeck's *Archiv*, 1893, xlv. 774); 139 cases by W. Whitehead of Manchester (*loc. cit.*), and 102 cases by myself (*British Medical Journal*, 1898, i. 541), making a total of 333 cases of various magnitude, with 42 deaths due to the operations. I made an attempt to classify the results according to the nature and extent of the operation, with the following results:

Uncomplicated removal of part or the whole of the tongue . . .	202	with	14	deaths
Excision below jaw, or removal of glands, and part or whole of tongue	62	„	13	„
Division of jaw	47	„	12	„

All the 333 cases could not be properly classified under these three headings, which appear to show that division of the jaw increases the danger of the operation very consider-

ably, and that it is very much more dangerous to remove the glands or to take out the tongue through the floor of the mouth than merely to perform an uncomplicated excision of the tongue. But, after all, these numbers must be accepted with the reserve that the complicated operations are not merely more fatal than the simple excisions, and should therefore be avoided, but that the disease in the cases under the second and third headings required much larger and more dangerous operations for its removal.

If disappointment is experienced at the high rate of mortality which still prevails after operations for the removal of cancer of the tongue, it must be remembered that even Kocher's method does not ensure anything like perfect asepsis, and that wounds in the neck and floor of the mouth are liable to become septic from the open wound in the mouth. Also that the better results which have been obtained have encouraged operators to perform larger operations in the hope of securing a larger proportion of cures. This has certainly been my own case, and I believe it has been that of most other surgeons who are largely engaged in mouth-surgery.

The cause of death is only stated in twenty-three of the forty-two fatal cases. Septic pneumonia, broncho-pneumonia, and general sepsis still occupy a very prominent place, for they account for twelve of the twenty-three deaths. And as might be expected, shock, exhaustion and hæmorrhage account for many deaths, no fewer indeed than eight. So these two general headings contain twenty out of the twenty-three fatal cases.

In order to reduce the mortality to the lowest point, I venture to recommend the measures I have described in the preceding section as usually adopted by myself: the placing of the patient on his side during the operation, with the head low and forward; a similar posture during the first days after the operation; the use of iodoform or iodoform gauze or both, for the wound in the mouth; and the method of feeding. And where it is possible to do so, to divide the operation into two parts, first the operation for the removal of the disease within the mouth, and, later, that for the removal of the glands in the neck. This is scarcely practicable when the disease runs deep into the floor of the mouth, particularly when it is under the tongue in front, and the patient must then take the

chance afforded him by the simultaneous performance of the two operations, large and dangerous though it be.

In spite of every care, I am afraid it will never be possible to reduce the mortality of operations for cancer of the tongue to a very low rate. For, in addition to the causes I have enumerated, many of the patients have broken-down constitutions, and are in wretched condition before they come under the care of the surgeon. The condition, both of the cancer of the tongue and of the patient, is so bad as to largely diminish the chance of recovery from the operation. I would refer those who are disposed to regard this statement as exaggerated to the *British Medical Journal* (*loc. cit.*), where I have compared the results of operations for cancer of the tongue in hospital and private practice.

Cures due to Operation.—Under this heading I am able to furnish far better results than I could in 1887. Once more taking the cases in which the operation was performed by Krönlein, Kocher, Whitehead, and myself, there are 199 which can be used for this purpose, and forty of the patients were either well and free from the disease, or had died of some other cause than cancer more than three years after the last operation. I hope, and fully believe, that these figures will be very much better in the next ten years, for the percentage of uncured cases is still enormous, eighty in the hundred. But—in spite of the local character of the disease, which is theoretically limited to the affected part of the tongue and adjoining parts of the mouth, with the associated lymphatic glands, I have no hope that we shall ever attain such great success against cancer of the tongue as we are likely to do against the much less local disease, cancer of the breast. The rapid extension of the primary disease, with the early affection of the lymphatic glands in many instances, and the curious eccentricity of glandular affection which is too often noted, are very difficult to combat successfully. The best hope of surgery lies in the early recognition of the various predisposing and actually precancerous conditions, and in removing them before they have developed into cancer. Warts and warty growths on old leucomatous tongues are, above all other conditions, dangerous, and should be dealt with at the earliest possible moment. And tongues which are the seat of old superficial glossitis, and begin to develop warts and warty growths, are so dangerous to

their possessors that the patients should be persuaded to part with them, even when there is no actual cancer on them.

The cases of actual cancer in which operation is likely to be most successful are those in which the disease is of limited extent, situated at the fore-part of the tongue, and has not penetrated deeply into the muscular substance. Also those in which the floor of the mouth is free, and in which the disease is quite limited to the tongue. Also those in which there is no obvious affection of the lymphatic glands.

The list of cured cases contains several in which the disease had recurred after the first operation, particularly in Kocher's practice, who seems to be more persistent and determined than most of us. Some of these operations were little short of ghastly, and I doubt whether we shall be tempted to imitate them. Sachs says that one of them comprised the removal of the entire tongue, resection of the middle portion of the lower jaw, total excision of the floor of the mouth, of the aditus pharyngis, with conservation of the posterior wall of the hyoid bone, of the epiglottis, and of the thyroid cartilage. Preparatory deep tracheotomy and sponge-tampon-canula. Duration of the operation more than four hours! The patient recovered from the operation! he was able to nourish himself sufficiently well by means of a tube, and was forced permanently to wear a tracheotomy tube. About seven months after the operation he presented himself at the Klinik, strong and well, but with recurrence in the trachea. He declined any further operation, and, indeed, I am not surprised.

Another of Kocher's operations for extensive recurrence occupied three hours in the performance, and was recovered from, but within seven weeks there was again a recurrence in the back wall of the pharynx. One wonders which to admire the more, the recuperative power of the patient or the determination of the surgeon.

Actual cancer of the lymphatic glands is, of course, a very unfavourable condition, so far as cure of the disease by operation is concerned. But, provided the glands are readily removable, and the disease has not spread from them into the surrounding structures, the case is by no means hopeless. Many of the cured cases were complicated, not only by enlarged glands, but by cancerous infiltration of them. In cases in which the glands have already become adherent to the sur-

rounding structures, operation offers a very small prospect of success, and I have known patients decidedly the worse for an unsuccessful attempt to remove the disease.

Are patients who are not cured relieved by operation?—To this question the answer undoubtedly is: "Yes, provided the operation has been successful in so completely removing the disease of the tongue that there is no recurrence within the mouth." The glands may become enlarged, and the neck, from the floor of the mouth down as far as the sternum and the clavicles, may be occupied by them; they may break down, and horrible ulceration may ensue; and death may be painful and distressing. But, however hard death from this cause is, death due to disease within the mouth itself is far harder to bear. Pain, salivation, difficulty of speech and swallowing, with attacks of dyspnœa, difficulty in preventing fœtor, hæmorrhage —all combine to produce as terrible a death as any produced by cancer. Certainly much more can be done now than even a few years ago to relieve patients suffering from fatal cancer of the tongue; but no means are so good as those which consist in such complete removal of the primary disease that there shall be no local recurrence. Naturally, those cases are the most favourable for this treatment in which the disease is seated far forward in the tongue; and in such cases I have not hesitated to remove the primary disease when there was such extensive and adherent affection of the glands that it was impossible to remove them. On the other hand, I do not approve of futile attempts to remove extensive disease seated far back in the mouth, when the tongue is adherent and the surrounding structures are involved. The recurrence is so speedy and the relief so short that the deferment of death for a few weeks is not worth the risk, distress, and anxiety of a severe operation.

Conclusions.—Malignant disease of the tongue* should be

* Although it is not within the province of this work to deal with the diagnosis of malignant disease, I cannot refrain from drawing attention here to the frequency with which the diagnosis of cancer of the tongue is still in doubt until the disease is advanced to a seriously dangerous condition, when an operation is often out of the question, or is only likely to be palliative. I would urge upon medical practitioners the desirability, nay, the necessity, of greater suspicion of cancer in any abnormal condition of the tongue in persons over thirty years of age. I have seen at least four instances within the last three months in which patients,

removed when it is so seated that it can be thoroughly taken away, and the patient is a fit subject for operation.

The operation may be performed through the mouth in the large majority of instances.

When the disease deeply affects the floor of the mouth, especially when it is associated with enlargement of the lymphatic glands, it will be best removed by an external operation.

Recurrent disease of the tongue should be removed, if it is accessible.

The prognosis in cases of recurrent disease is far less favourable than the prognosis after the removal of primary disease.

The glands of the neck which most closely correspond with the diseased portion of the tongue should be removed, whether they are enlarged or not, provided they are sufficiently movable. When it is possible the operation for the removal of the glands should be deferred until the patient has completely recovered from the operation for the disease within the mouth, as the danger is largely lessened by dividing the operation into two parts.

Unfortunately, the removal of the corresponding glands does not promise success equal to that which is so often attained by the removal of the axillary glands in association with cancer of the breast. For there is not the same certainty regarding the group of glands likely to be affected on the same side of the neck, and in some cases the glands on the opposite side of the neck to the disease become cancerous, even when the primary disease is situated on, and confined to, the border of the tongue.

The primary disease may be removed by operation in cases in which there is such affection of the glands that they cannot

whose lives were very valuable, have been under treatment for weeks or months by very competent practitioners, who assured them again and again that the steadily advancing cancer of the tongue was of no importance In a large number of cases in which the clinical characters are somewhat doubtful, the diagnosis can be certainly made by the microscopical examination of *sections* of a little piece of the edge of the disease, which can be cut out without danger and with little pain after painting the part with twenty-per-cent solution of cocaine. The Clinical Research Association or some similar society undertakes for a small sum the preparation and examination of such fragments of disease.

be removed, provided the removal of the primary disease is likely to be so thorough that there shall be no recurrence within the mouth.

And, once again, I would urge the removal of warts, warty growths, nodules, ulcerated fissures, and chronic ulcers, with other pre-cancerous conditions, if they do not readily yield to treatment in persons who are over thirty years of age. They may not be cancerous at the time of their removal—so much the better; but if they are left, and particularly if they are irritated by natural or artificial causes, they will certainly become cancerous.

CHAPTER XIV

PALATE

PRIMARY malignant disease of the palate is undoubtedly rare. Although I have seen and operated on a fair number of tumours of the palate, I have seen very few cases of malignant disease, whether carcinoma or sarcoma. I am speaking of primary disease of the palate, not of disease which has spread on to the palate from the neighbouring parts. Since the publication of the last edition of this book a great deal of very useful work has been performed on the structure and classification of tumours of the palate. The best collection of cases, and the ablest contribution to the subject up to that time was Mr. Stephen Paget's paper in the St. Bartholomew's Hospital Reports (1886, xxii. 315). The resemblance of the structure of many of the tumours of the palate to those of the salivary glands was pointed out. But the common origin and nature of these tumours was not arrived at. In 1892, Nasse (*Langenbeck's Archiv*, xliv. 233) contributed an excellent article, in which he showed that many of the "mixed" tumours of the salivary glands, of the palate, and elsewhere in the head and face, were certainly derived from endothelium, particularly the tumours to which the name of cylindroma and plexiform sarcoma had sometimes been applied. This paper was followed by two other papers of equal ability in the thirty-ninth and forty-first volumes of the *Deutsche Zeitschrift für Chirurgie* (1894 and 1895), the first by Eisenmenger on the plexiform sarcomas of the hard and soft palate, the second by Rudolf Volkmann on endothelial tumours. So far as one is able to judge it may, I think, be taken that most of the innocent tumours, whether of the hard or soft palate, are endotheliomas, and that most, if not all, of the tumours which were at one time regarded as spheroidal-celled carcinomas are endotheliomas; and that a large number of tumours which were

formerly classed among the sarcomas (plexiform sarcomas and cylindromas) are really endotheliomas. On the other hand, there is no doubt that both the hard and the soft palate are liable to squamous-celled carcinoma (epithelioma), and that round- and spindle-celled sarcomas occur there from time to time, but very rarely.

Most of the endotheliomas, both of the palate and of other parts, such as the parotid, are quite innocent, enclosed in perfect capsules, and easily shelled out, even when they have existed for many years and have worn deep depressions in the bone, or perforated through into the antrum. When some of these tumours, owing to their peculiar structure, were classed among the sarcomas, they differed from the true sarcomas in their slow growth, their comparative isolation, the consequent ease with which they were removed, and in the absence of any tendency to recur. As they were quite as numerous as the true sarcomas, they conferred upon all the sarcomas of the palate a reputation of less malignancy than the true disease deserves. From a renewed study of the subject I have come to the conclusion that malignant disease of the palate, whether carcinoma or sarcoma, is a very malignant disease, and that its reputation of mild malignancy was unjustly gained from the inclusion among the sarcomas of a number of cases of endothelioma. At the same time it must be borne in mind that there are malignant, as well as innocent, endotheliomas. I do not yet know whether they can be microscopically distinguished from the innocent varieties, but I expect it will be possible to distinguish them by-and-by by their more disorderly structure. Clinically, they are of much more rapid growth, are far less circumscribed, and cannot be shelled out from the surrounding structures.

Sarcoma of the palate, from the few genuine cases which have been described, appears to form a rounded, or lobed, or flattened tumour beneath the mucous membrane, so that there may be the greatest difficulty in distinguishing it in the early stages from the innocent tumours. But it grows with much greater rapidity. If allowed to do so, it becomes adherent to the mucous membrane and ulcerated. In other cases, the disease is, from the first, much more diffused and becomes early and intimately connected with the surrounding parts, such as the pharynx and the tonsil. The lymphatic glands at the

angle of the jaw and in the neck are liable to be affected, but I have no idea of the constancy of this affection, or of the proneness of the disease to become disseminated. A greater number of cases of sarcoma in which there is no suspicion that the tumour may really be an endothelioma will be required to decide this and other points in the pathology of sarcoma of the palate.

There are at least five cases on record of melanotic sarcoma of the palate, by Gussenbauer, Treves, Billroth, Eisenmenger (from Albert's Klinik), and Volkmann (from the Marburg Klinik). The tumour was round- or spindle-celled in all the cases in which a microscopical examination was made. The lymphatic glands were enlarged in most of the cases. And the malignancy of the disease is evident from the fact that both Billroth's and Albert's cases were regarded as beyond the reach of an operation.

It is curious that, while a dozen years ago I spoke of spheroidal-celled carcinoma as an undoubted disease of the palate, and only suggested that the palate might also be the seat of squamous-celled carcinoma, I must now reverse that dictum and say that squamous-celled carcinoma undoubtedly occurs primarily in the palate, while it is improbable that spheroidal-celled carcinoma ever occurs there as a primary disease. Squamous-celled carcinoma of the palate may attack primarily the hard or soft palate, and may spread thence all over the palate and to the adjoining structures. It rapidly ulcerates, as it does in almost all parts of the body, and in most cases forms a sore with an indurated base and raised borders. The glands behind the angle of the jaw are liable to become affected, but there is no evidence to show that dissemination need be feared.

So far as I can judge there is little to be said of any essential difference between sarcoma and epithelioma of the palate, except that ulceration occurs early and is practically constant in epithelioma, while sarcoma forms a prominent tumour, which ulcerates, almost as it were, by accident. Both diseases attack men much more frequently than women; both are diseases of advanced or advancing age; both run a rapid course, often forming a serious disease within two or three months of the time they are discovered. Both begin more frequently on the hard palate. Both produce secondary affection of the

lymphatic glands at an early period. Neither is known to be disposed to dissemination, although this must be regarded as more likely to occur in association with sarcoma. Finally, it must be admitted that both diseases appear to be peculiarly fatal, even when a free operation has been performed.

Of course, it must be understood that this account has, under the altered circumstances of the pathology of tumours of the palate, been drawn up from a small number of cases, in which the diagnosis was very clear. I have only seen one case of carcinoma of the palate myself.* The patient was a waiter, between forty and fifty years of age, and was suffering from an ulcer, which had all the characters of an epithelioma. There was no enlargement of the lymphatic glands. I cut the disease out very freely. A few months later, the patient returned with hard and fixed glands in the neck, quite beyond the reach of an operation. There was no recurrence of the primary disease, which was proved by microscopical examination to be squamous-celled carcinoma. This case fully bears out what has just been said of the danger of malignant disease of the palate.

Methods of Operation.—The great difference in the situation, relations, and extent of the disease renders it impossible to do more than suggest the lines of operative treatment which may with advantage by pursued.

The mouth should be widely opened by means of a strong gag, the cheek on the side opposite to the gag drawn back with a copper or plated retractor, and the patient placed opposite the best light which can be procured. The lateral posture will be found the safest, as it is in many of the operations on the interior of the mouth. And the head should be low and forwards, so that blood tends to escape from the mouth. When the patient is under the influence of the anæsthetic (chloroform preceded by ether, as a rule), the exact extent and relations of the disease can be more accurately determined. Whatever the diagnosis, it will in most cases be expedient to incise the soft parts at the anterior margin of the tumour, to see whether it is possible to enucleate it, for it is sometimes very difficult to distinguish between a malignant and a quite innocent tumour. I believe that the lack of this

* I have, within the last few days, operated on a second case of squamous-celled carcinoma. It was of the hard and soft palate.

precaution has resulted in the performance of a large and dangerous operation in quite a number of instances in which a simple enucleation would have been effected in a few seconds with quite as satisfactory an issue. If the tumour is malignant, it will almost certainly be so adherent that it cannot be shelled-out, and it must then be removed with a wide area, at least half an inch, of the surrounding apparently sound tissues. The soft parts may be cut through with a strong knife down to the bone, so as to map out the total area to be removed. The bone must be cut away, and this can generally best be done with chisel and mallet. For the purpose of smoothing down inequalities which remain, the parrot-bill forceps are excellent. Various forms of cautery, which are often employed, and with which the entire operation has sometimes been performed, are, to my mind, not very desirable. Of course, there are occasional cases in which it is much more easy to arrest hæmorrhage with the thermo- or electric-cautery than by other means. In such cases, the cautery should certainly be employed.

The posterior palatine artery, the only artery of tolerable size which is likely to be divided, may be ligatured. Or, if this is impossible, the posterior palatine canal may be plugged with gauze so as to completely control the hæmorrhage. The canal lies on the inner side of the last molar tooth, about one-third of an inch in front of the hamular process. The raw surface may be packed for four-and-twenty hours with iodoform gauze, which serves to check continuous oozing, and to protect the wound from injury. The packing may be renewed daily, or the surface may be powdered with iodoform. As a rule, there is no difficulty in taking food by the mouth in the usual manner. But if there should be, the patient may be fed for a few days with a tube and funnel.

Three questions are sometimes raised in connection with operations for malignant disease of the palate: the necessity for an incision through the cheek or upper lip; the desirability of a preliminary tracheotomy; and the preliminary ligature of the common carotid artery.

In the case of large tumours, in aged persons, where there is reason to apprehend abundant hæmorrhage, which the patient can ill afford, I regard the division of the cheek as a wise precaution. The only objection to it is disfigurement, which ought not to be taken into account in such cases.

I have a great personal objection to a preliminary tracheotomy, unless it is absolutely necessary. It adds a little more to the immediate danger of the operation, and often very much retards the recovery of the patient; especially when a large tube, like Hahn's, has been employed. Yet, if tracheotomy is needed, it is to prevent blood being sucked down into the air-passages. so that Hahn's or some similar tube must be employed. I believe that the lateral posture is quite reliable in preventing the entrance of blood into the air-passages. And during the operation and immediately after the removal of the disease, pressure applied by means of pads of gauze and sponges will control the hæmorrhage.

I cannot understand any reason for ligature of the carotid artery before the removal of the disease; and I cannot but think it has generally been applied under a false estimate of the extent and gravity of the operation. Even supposing that a large piece of the bone needs to be removed, and that the soft and hard palate are taken away, the operation, after all, is very much less than that for the removal of extensive sarcoma or carcinoma of the upper jaw. Indeed, it is only a modification of that operation. As we are not in the habit of tying the carotid artery as a preliminary to the major operation, I cannot understand any reason for tying it as a preliminary to the lesser operation.

Results of Operations.—In the dozen cases of operation for undoubted malignant disease of the palate, whether sarcoma or carcinoma, there was no casualty. In most of the cases, the operation was restricted to the removal of the tumour or ulcer, with the parts around it, which generally included a sufficient portion of the bone. In two cases, the glands were removed at the same time as the primary disease; and two of the operations for recurrent disease comprised the removal of the upper jaw with (in one of the cases) the diseased lymphatic glands. These two operations were performed on men forty and forty-eight years old respectively. The other operations were performed on patients very much older, generally averaging sixty years of age.

Although the operations have been singularly free from fatal consequences, considering the situation of the disease and the age of most of the patients, I am afraid that little can be said of their success in other respects. In all the cases which were

followed up for even a few months, recurrence of the disease had taken place, or there was affection of the lymphatic glands. And the local recurrence appears to have been almost always very rapid. The histories are of recurrence in the course of a few weeks, in three months, in four months, in four months, rapidly, and in the course of a few months. I do not know what may be in store for the future of these operations, but there is little encouragement in the records of the past. It is to be hoped that much earlier diagnosis may lead to earlier and more successful operations, which may at least succeed in averting death from local recurrence.

CHAPTER XV

TONSIL

THE tonsil is subject to both sarcoma and carcinoma, particularly to lympho- or round-celled sarcoma among the sarcomas, and chiefly to epithelioma among the carcinomas. For practical purposes it is scarcely necessary to consider separately the two diseases, for they appear to be equally, and in essentially the same manner, fatal. I shall, therefore, include them under the common name of malignant disease or cancer, and shall only mention one or two points in which they differ from each other.

Males are much more subject to tonsillar cancer than females, and the disease, of whatever kind, attacks almost invariably males of adult age. But while epithelioma is a disease of middle and advancing adult age, sarcoma may occur in much younger subjects, and has been often observed in persons under twenty years of age. Epithelioma quicky ulcerates, forming flat plaques or deep and foul cavities ; but sarcoma far more frequently forms a distinct and prominent tumour, which may be rounded, smooth, and unbroken on the surface, or ulcerated more or less deeply. In the few cases in which soft carcinoma has been observed and confirmed by microscopical examination, the disease has formed a prominent tumour similar to that produced by sarcoma. Epithelioma has a great tendency to spread to the neighbouring structures—the palate, tongue, and pharynx, while sarcoma is often limited for a long time to the tonsil or tonsillar region. No matter what the variety of the disease, it runs a peculiarly rapid course to death, affecting the lymphatic glands at a very early period, and producing large and widespread tumours in the neck. This circumstance, so fatal to all attempts to cure by operation, may be explained by the very intimate relation which exists between the tonsil and the cervical lymphatic glands. Even the ordinary chronic enlargement of the tonsil is almost invariably associated with

enlargement of the cervical glands; it is, therefore, not to be wondered at that carcinomas which affect the glands at an early period in other parts of the body have a still greater tendency to do so when they originate in parts which are so closely connected with the glands as are the tonsils. And when the peculiar character of the primary sarcomas of the tonsil, their similarity to the structure of the organ, whether in health or in disease, is taken into account, it must be admitted that the absence of glandular affection in connection with primary sarcoma of the tonsil would be more remarkable than its occurrence. So early in the course of the disease are the glands affected that they may appear as large swellings in the neck within a few weeks of the period at which the first signs of disease were noticed by the patient. On the other hand, there may be no visible or tangible glandular enlargement until six or more months have elapsed from the first occurrence of enlargement of the tonsil. The disease proves fatal, in very many instances, within a year or even six months of its first appearance; indeed, few persons survive for more than three-quarters of a year. The end is brought about in many of the cases of sarcoma by hæmorrhage; in other cases by exhaustion due to dysphagia and discharge, or a combination of various causes. Among these causes, that which probably plays by no means an unimportant part is the occurrence of secondary affection of internal organs and tissues. For, although the number of autopsies on which we can rely for information is small, the comparative number of instances in which secondary affection was present is large, even although the disease was only known to have existed for a few months. This again will not appear striking to those who are acquainted with the malignancy of the peculiar form of sarcoma which attacks the tonsil, and with the rapidity with which round-celled or lympho-sarcoma of other parts of the body—the testicle, the bones, &c.—become generalised.

Methods of Operation.—The method which is selected will depend chiefly on the character of the disease and the presence or absence of affection of the lymphatic glands. The tonsil may be removed from within the mouth or through an opening in the side of the neck. When the glands are enlarged, the operation from within the mouth can only be regarded as a palliative measure, unless at the same time an attempt is made

to remove them through an external incision. I shall describe both methods of removal, and state the conditions under which either of them may be employed.

Removal through the mouth is much more frequently practised for sarcoma than for carcinoma, for the very good reason that the former usually forms a prominent tumour, and, in the earlier stages of the disease at least, does not so far involve the neighbouring structures that it cannot (apparently) be removed completely. The mouth is widely opened by means of a gag, the patient placed, with the head slightly raised, in face of the best light which can be procured, and anæsthesia is maintained through the medium of a tube introduced at the side of the mouth or through the nose. The instrument used for the actual removal is either a benzine cautery, a galvano-cautery, or an écraseur. With the first of these, the hot knife (at a red, not a white heat) is made to cut through the tissues at the base of the tumour from before backwards. With either of the other two the loop is passed round the base of the growth as far down as possible. If the galvano-cautery is employed, the loop is heated to a dull red heat, and in either case the mass is cut slowly through, which is usually easily performed, for the tumour is generally soft. It is curious how little hæmorrhage occurs in the large majority of cases, even when the écraseur is used, especially when the vascularity of these growths is remembered. Instead of employing a cautery or écraseur, the finger may be the only instrument required, and the growth may be even more completely removed than with cautery or écraseur; for some, if not many, of the tumours are found to be easily separable from the bed in which they lie, and are so circumscribed, if not encapsuled, on the under aspect, that there is not the least difficulty in shelling them out. Unfortunately they are not the less prone to recur, even *in sitû;* and a new growth may appear as speedily and certainly as if there had been great difficulty in defining the limit of the primary growth and separating it from the surrounding tissues. Hæmostatics, or other special means of arresting the bleeding which takes place after the removal, are scarcely ever needed; nor is any special after-treatment necessary more than would be required after the removal of a simple enlargement of the tonsil.

In cases in which the disease in the fauces is much more

advanced, affecting the base of the tongue, the half-arches of the palate or the margin of the palate itself, it may still be removed with safety through the mouth, care being taken to use instruments which shall be tearing and bruising rather than cutting. In such cases cauteries are also peculiarly applicable. The operation through the mouth is, however, rarely employed in advanced cases, unless for palliative purposes, on account of the almost certain affection of the cervical glands.

Removal through an incision in the neck was, I believe, first practised by Cheever, but has since been adopted by Czerny and other surgeons. It appears to be a very formidable proceeding, on account of the depth at which the tonsil is seated and the number and importance of the structures which lie between it and the skin; but in truth it is far less formidable than might be thought, and permits not only a free removal of the affected tonsil, but also of any glands which are enlarged. The method of performing the operation varies according to the condition of the tonsil, whether it is apparently easily separable or not, or whether the disease has widely involved the surrounding structures.

The proceeding of Cheever consists in making an incision, about three or four inches in length, along the anterior border of the sterno-mastoid muscle, from the level of the ear to below the level of the tumour (which can probably be felt through the neck). A second incision is made, at an angle to the first, along the body of the inferior maxilla. The dissection is carried carefully down through the intervening textures, drawing the vessels and nerves aside, until the tonsil is reached, when it is removed with as little actual cutting as possible, perhaps by means of one of the cauteries.

The operation practised by Czerny is of a much more formidable character. The patient is placed deeply under the influence of chloroform, and, to guard against the entrance of blood into the trachea, a preliminary tracheotomy is performed, and Trendelenburg's or some equally efficient canula is introduced. An incision is then made downwards and outwards, from the angle of the mouth to the anterior border of the masseter muscle, and beyond it to the level of the hyoid bone. Through this incision the lower jaw is exposed and sawn through, between the second and third molar teeth, in a direction from above and internal, to below and external, and

the two fragments of the bone are held asunder. The tumour is by this means laid bare, and to remove it, it may be necessary to divide the digastric, stylo-hyoid, and stylo-glossus muscles, the hyo-glossal, glosso-pharyngeal, and gustatory nerves, as well as the lingual and other vessels. The tumour is then cut or torn out, and the bleeding points are touched with the cautery. The wound is thoroughly washed out with carbolic lotion or dusted with iodoform, or treated in such an antiseptic manner as seems best; the fragments of the lower jaw are brought together by means of a silver wire passed through the middle of both, a second wire is twisted round the second and third molar teeth, and the external wound is closed with sutures, except at the points where it is deemed expedient to insert drainage-tubes. The opening in the mucous membrane within the mouth may also be brought together with sutures if it is desired to hasten the healing or prevent discharges from making their way into the stomach or lungs.

During the first few days after the operation the patient should be fed through a tube twice in the twenty-four hours, and the tracheotomy tube may with advantage be retained. If the case makes good progress, the tracheotomy tube and the introduction of food through a tube may be quickly dispensed with, and in the course of a fortnight the silver wire may be removed from the molar teeth. The wire through the fragments of bone may be left there permanently if it does not produce any irritation.

Mickulicz (*Deutsche Med. Wochenschrift*, xii. 157, 1886) practised in several instances a more radical operation than even Cheever and Czerny. Making an incision from the mastoid process downwards and forwards as far as the greater horn of the hyoid bone, and raising the soft parts from the jaw-bone, taking care to respect, if possible, the facial nerve, he separated with a raspatory the periosteum from the outer and inner aspects of the lower jaw just above the angle. He then sawed through the jaw beneath the periosteum, divided the tendon of the temporal muscle, and resected the ascending process of the bone. After drawing aside with strong hooks the body of the jaw, the masseter, internal pterygoid, digastric and stylo-hyoid muscles, he found the surface of his wound corresponded as nearly as possible with the region of the

tonsil, and by dividing the lateral wall of the pharynx he obtained access to the palate, the base of the tongue, and the posterior wall of the pharynx as far up as the naso-pharynx; and by dividing the digastric muscle and the hypoglossal nerve he could reach the entrance of the larynx. By this proceeding the lymphatic glands were removed if needful, and the operation completed up to the final act, without opening the cavity of the mouth and pharynx; so that complete narcosis could be maintained, and the entrance of blood prevented almost through the entire operation. Nevertheless, he found it expedient to perform a preliminary tracheotomy with the use of Trendelenburg's (or Hahn's) tube.

Mickulicz claims for this operation not only ease in reaching and removing the disease, and in dealing with the lymphatic glands, together with the advantages which have just been mentioned, but further, that the whole wound communicates freely with the outside, and can be dressed antiseptically. So far from the resection of the ascending process of the jaw being a disadvantage, it offers a positive advantage; when the operation has involved the palate and base of the tongue, there results, in cases in which this resection has not been performed, so considerable a contraction of the scar as seriously to affect the movements of the lower jaw, but after the resection of the process this contraction is not experienced.

Results of Operations.—Although I have not been able to collect a very large number of cases of operation for malignant disease of the tonsil, I have a much larger number than when the first edition of this book was published. I quite agree with Newman (*Malignant Disease of the Throat and Nose*, Edinburgh, 1892) that the disease is not nearly so rare as I supposed it to be some years ago; for, in addition to numerous cases of sarcoma and carcinoma published in various journals and magazines, I have seen many cases in my own hospital and private practice. Honsell (*Beiträge z. klin. Chir.* Tübingen, 1895, xiv. 737) has collected more than one hundred cases from different sources. Watson Cheyne (*Objects and Limits of Operations for Cancer*, London, 1896) has put together many cases, and although the two collections overlap each other somewhat, Cheyne's tables contain a good many cases which are not to be found in Honsell's list. Of course, all the patients were not submitted to operation, but I have been able

to analyse more than seventy cases in which operations were practised.

Mortality due to the Operation.—Fourteen of the seventy-three patients died of the effects of the operation, a very considerable mortality, and still more considerable when the distribution of the deaths is discovered. The *internal* operations, whether the tonsil was cut out or shelled out from its bed, or removed with the cold wire or hot wire, or with the thermo-cautery, were so free from risk that only one out of twenty-eight patients died of the effects of the operation, apparently from sloughing of the tissues about the bed of the tonsil. On the other hand, the *external* operations and the combinations of the internal and external method, forty-five in number, resulted in a mortality of thirteen, as nearly as possible twenty-nine per cent. I cannot discover that one of these external operations is much more fatal than another. The truth is that the removal through an external incision of a number of glands, sometimes adherent to the surrounding structures, and then necessitating the ligature of large vessels such as the external carotid artery and internal jugular vein, and the removal of the tonsillar region with a part of the palate, tongue, or pharynx, leaves a large wound which must necessarily be septic. Hence, danger of pyæmia and septicæmia, of septic pneumonia, of secondary hæmorrhage. Cheyne particularly mentions secondary hæmorrhage, because it has become so rare in modern surgery. It occurred from the external carotid artery in one of his own cases, and in three of those which he collected. Also, one patient died of secondary hæmorrhage from the common carotid artery, which had been ligatured at the operation. Where ligature of these large arteries can be avoided, there can be no doubt that it is desirable not to tie them. If the operation could be divided into two parts, by the removal of the disease in the tonsillar region through the mouth as the first part, and the removal of the glands as the second part, some two or three weeks later, the danger would be reduced to very small dimensions. In some of the cases of sarcoma this can be successfully accomplished, for the disease of the tonsil is often limited in extent, the tumour may even be encapsuled, and the surrounding structures are sometimes quite free from the disease. But, in the cases of carcinoma, particularly of epithelioma, the primary disease so often extends

beyond the region of the tonsil, and is sometimes so fixed, that no internal operation suffices for its thorough removal.

Personally, I prefer the method of shelling out the tonsil from its bed, when that is applicable, to the use of the écraseur, the thermo-cautery, or the hot or cold wire. It is very easily performed, and is so seldom associated with severe bleeding or with subsequent risk or even great discomfort, that I have often shelled out the disease in the mouth solely for palliative reasons, when the glandular disease was too extensive and fixed to admit of removal. I have never performed Cheever's or Mickulicz's operation or divided the jaw, because it so happens that I have not met with a suitable case. For the dressing of the wounds left by the internal operation I have used only iodoform, and have never found it necessary to feed the patient through a tube. Nor have I ever performed a preliminary tracheotomy, save once, when I removed an epithelioma of the tonsil, which had extended to the side of the back part of the tongue. I was not at all favourably impressed by the result, although it enabled me to deal with the disease with less anxiety, as the trachea was filled by a Hahn's tube. But the subsequent difficulty of coughing up phlegm from the back of the throat added largely to the patient's suffering, and so much to the risk of the after treatment that I feared I should have lost him. At that time I determined not to perform tracheotomy in these cases, if it could be avoided. As in my later operations on the tongue, so in these, I prefer to place the patient on his side, with the head forward, so that the blood runs into the cheek and out of the mouth, instead of into the pharynx. I also use reflected light for marking out the incision, which I usually make with scissors at some distance around the tumour before beginning to shell it out. If the hæmorrhage is very free, it may be arrested or much diminished at any time during the operation by thrusting a strip of gauze into the bed of the tonsil, and keeping it in place with the finger. I have seen more hæmorrhage from the shelling-out of an inflamed tonsil than from the removal of a malignant tumour. If the hæmorrhage were very severe I think it would be possible, after the removal of the disease, to fasten a plug of gauze in the bed of the tonsil by bringing the arches of the palate as closely together as possible over the plug by a couple of stout silk sutures. If, by

any chance, one of the large arteries of the neck were wounded or torn in the operation, I am afraid neither pressure nor ligature would be successful in averting a fatal issue. But I am not aware of any case in which this has happened during the course of an internal operation for the removal of malignant disease of the tonsil.

Cures due to Operation.—Although I cannot even now, with many more cases at my disposal, offer a very hopeful view of the surgery of malignant disease of the tonsil, I am nevertheless able to tell a much better story than I did some years ago. My first study of the disease led me to regard it as almost hopeless from a surgical point of view. In the first edition of this work I was able to relate some partial successes, but there was not then *one* case in which the patient had lived for the full term of three years after the operation, so that not one person could be claimed to have been cured.

At present I have the further history of fifty-four cases in which operations of various severity were performed, and they tabulate as follows:

Died of the operation	14
Alive or dead with recurrence (in mouth or glands)	20
Died of cancer elsewhere	3
Well from one to three years	8
Well more than three years	9
Total	54

There are therefore nine cases which may be claimed as successes, and eight more cases in which it is possible success may be achieved—a great improvement on the former statistics. Of the nine cases, five were of sarcoma, generally round-celled or lympho-sarcoma, and four of carcinoma, generally epithelioma. The successes are, then, distributed almost equally between the two diseases, thus proving that both sarcoma and carcinoma are amenable to operation under certain circumstances.

Those circumstances are very clearly shown by a study of the successful cases, and of those which were partially successful. In ten of the seventeen cases the disease was removed from within the mouth, and no external wound was made. In two of these glands were removed at a later period, and in one of the two they were removed on two occasions, three months and ten months respectively after the operation

on the tonsil. But, in the other eight cases in which the operation was performed through the mouth, it was never necessary to perform an operation for removal of lymphatic glands. There can be no clearer proof of the comparatively early stage or mild character of the disease. In two of the nine successful cases, the disease (sarcoma) is described as having been encapsuled, again a favourable condition. The manner in which removal was effected through the mouth varied. In some cases the thermo-cautery or galvano-cautery was used; in others the écraseur or cold wire, and in others again, the tonsil was shelled out of its bed.

In six cases the disease, including the affected glands, was removed through an external incision, by a more or less severe procedure, and in one case the operation was partly internal, partly external.

Of course a percentage of more than sixteen cures is not bad when compared with the results of operative treatment of malignant disease in many other parts of the body. But it looks better than it really is. For there must be set against it the larger number of cases which were not treated surgically, because they were beyond the reach of benefit, the large mortality of the larger operations, and the fact that very few of the operations were performed for palliative purposes, as they frequently are in other parts of the body—the breast, the tongue, the jaws, for example.

In my earlier study of malignant disease of the tonsil, I attributed the failure of operations to the intense malignity of the disease, particularly to the rapidity with which it affects the neighbouring lymphatic glands. Dr. Newman suggests that the true explanation of our ill-success is probably the advanced period of the disease at which the surgeon has the chance of dealing with it. I am quite disposed to accept this view for a large number of the unsuccessful cases. And I quite hope that the next decade may furnish proof of its correctness in the larger proportion of successful operations. But I am not sanguine of a very large percentage of success, for two reasons: First, because the disease is often very insidious in the early stages. I have seen several examples of this, particularly one lately, which struck me very much. I was consulted by a medical man suffering from advanced epithelioma of the tonsil and neighbouring structures, with affection of the

lymphatic glands. It had given him so little trouble that he had only just recently examined his throat to see whether there was anything really amiss with it. Yet the disease, when I saw it, was practically hopeless from an operative point of view. Second, because I am still of opinion that many of the cases, both of sarcoma and carcinoma, are very rapid in their course, and are not likely to be cured by operation, even if they are treated at a very early period. The very early affection of the lymphatic glands in some instances, and the generalisation of the disease which has been observed in some of the cases of sarcoma, lead me to this opinion.

Early diagnosis, as in relation to malignant disease of other parts of the body on which operations are performed, is the point to which the attention of medical men must be directed. It is not so difficult for epithelioma as for sarcoma, when once the patient comes under the care of his medical attendant. The indolent ulcer, with its hard, everted, and uneven border, cannot fail to excite suspicion. And the nature of the disease may be definitely proved in almost all cases by the removal of a fragment of the border for microscopical examination. It is otherwise with the commencement of sarcoma, which may look so like an ordinary hypertrophy of the tonsil that weeks may elapse before the attendant even admits the possibility of malignant disease. Nor does a microscopical examination afford such clear proof of the nature of the disease as it does in the case of squamous-celled carcinoma. Speaking in general terms, it may be said that a steady enlargement of one tonsil, in an adult, without any sign of inflammation or of fever, should suggest the possibility of malignant disease, especially of round-celled or lympho-sarcoma.

Are patients who are not cured relieved by operation?—On this point the answer must be decidedly in the affirmative, provided the tumour is so situated and of such a kind that it can be readily reached and removed through the mouth. Those cases are peculiarly fitted for a palliative operation in which the disease is large, rounded, and prominent, as some of the lympho-sarcomas are. In such cases, whether the glands are enlarged or not, the primary disease may be shelled out or removed with the galvano- or thermo-cautery with little danger or difficulty, and with great and almost immediate relief of dysphagia and sometimes of dyspnœa.

Conclusions.—Malignant disease of the tonsil, whether sarcoma or carcinoma, may be removed through the mouth or through an external incision; or by a combination of both methods.

The operation through the mouth is suitable for those cases in which the disease is not deeply fixed, and in which the lymphatic glands are not enlarged.

The external operation should be employed almost only in those cases in which the disease is of wide extent and deeply fixed, and in which the glands are already enlarged; when the case seems in other respects suitable for an operation. The mortality from the operation is very large, and is likely always to remain large in comparison with the mortality of those operations in which strict asepsis or antisepsis can be obtained.

The best hope of the future rests in early recognition and removal of the disease.

The operation for the removal of the primary disease can then almost always be performed through the mouth with a very small danger of death.

If, in such cases, the glands in the parotid region are removed by a routine operation, whether they are enlarged or not, there is every reason to expect far better results from operation in the future.

The removal of the lymphatic glands should not be performed at the same time as the removal of the disease through the mouth, but should be deferred for two or three weeks until the patient can take food quite comfortably. By this precaution the danger of the operation is greatly lessened.

CHAPTER XVI

LARYNX

THE larynx is subject to sarcoma and carcinoma, but much more to the latter than to the former. For practical purposes, particularly with regard to operative treatment, it is necessary to consider the two diseases separately, and further to divide the intrinsic from the extrinsic carcinomas. The intrinsic are those which grow from the vocal cords, the ventricles, the false cords, and the parts below the true cords. The extrinsic tumours are those which take their origin in the epiglottis, the ary-epiglottic folds, the inter-arytenoid fold, and the parts forming the framework of the larynx. On the other hand, it is not needful to separate the different varieties of carcinoma or the different varieties of sarcoma.

Sarcoma may arise in almost any part of the larynx, but much more commonly grows from the intrinsic than the extrinsic parts. It attacks males much more frequently than females, and although it is not limited in its occurrence to any age, is essentially a disease of adults. The tumour may vary much in outward aspect, and may form an actual tumour or an irregular papillary or warty growth. Unlike the simple papillomata, however, it usually forms at the same time a distinct mass, and is sessile, not pedunculated. It grows on the whole slowly, and slowly affects the subjacent tissues, and in this manner may extend from the larynx to the tongue and pharynx, from the cords to the framework of the larynx. There is little or no tendency to secondary affection of the lymphatic glands, nor does it appear at all likely to produce secondary growths in the internal organs or other tissues of the body. It is therefore essentially a local disease, capable of producing extensive destruction of the larynx and implicating all the surrounding structures; but very rarely, so far as our present knowledge teaches, producing secondary sarcomas.

The tendency of the disease is to cause death from suffocation or exhaustion, and this may take place within a year or eighteen months of the first appearance of the symptoms. But the course of the disease is in most instances much slower; and even if suffocation is not averted by tracheotomy, the patient may live for two, three, four, or more years.

Intrinsic carcinoma may grow from the false or true cords, from the thyroid angle, the ventricle, or from the parts below the cords. It has frequently the aspect of a warty growth, but may form a distinct tumour, and may not at first be distinguishable from a simple tumour or a sarcoma. Ulceration takes place almost invariably at an early period, and, what is more important for our purpose, the disease infiltrates the subjacent structures, and spreads from the part in which it took its origin to the adjoining parts of the interior of the larynx, and thus in many instances involves the entire organ. From the interior of the larynx it may reach the surrounding structures. The lymphatic glands are only occasionally affected. There is little probability that the internal organs or distant parts of the body will be the seat of secondary growths. The disease is rarely rapid in its progress, and although death may ensue within a year, it is much more usual for the fatal termination to be delayed for two, three, four, or more years.

Extrinsic carcinoma is a much more formidable affection. It may originate in the epiglottis, the ary-epiglottic folds, the arytenoids, and the upper and posterior parts of the inter-arytenoid fold. From the part in which it takes its origin it usually quickly spreads to the surrounding parts, and may involve the pharynx, tongue, tonsils, and palate. The lymphatic glands are affected in the large majority of instances, and at a comparatively early period of the disease. But, as in the case of intrinsic carcinoma, there is very little probability that the internal organs will be the seat of secondary growths. The duration of life is shorter than for intrinsic carcinoma, so that many of the patients die within a year or eighteen months; yet it is not impossible that life may be prolonged for two or three years.

Both intrinsic and extrinsic carcinoma attack men far more frequently than women, and are diseases essentially of adult age.

In considering the desirability of radical operations for malignant disease of the larynx, it will have to be borne in

mind that life is in a large number of instances prolonged by tracheotomy, so that death from suffocation, which might naturally be expected from the situation of the disease at the entrance to the air-passages, is comparatively rare.

Methods of Operation.—Although removal of the disease, whether sarcoma or carcinoma, *per vias naturales* has, in a certain few instances, been attended with brilliant results, I am strongly of opinion that this method should not be employed unless in very exceptional cases, particularly those in which the disease is very limited and quite on the edge of the vocal cord, and in which extreme old age or serious impairment of health preclude an external operation. The uncertainty of the method, the probability that the disease will not be sufficiently removed, and the possibility of irritating a very indolent disease and exciting it to rapid and dangerous growth must all be taken into account in deciding to attempt the removal of a malignant disease through the mouth. And, to my mind, it requires greater courage to undertake such an operation than to open the larynx and remove the disease by the operation of thyrotomy.

Supra-thyroid Laryngotomy is occasionally performed for the removal of growths situated at the upper opening of the larynx, particularly in connection with the epiglottis. A transverse incision is made through the thyro-hyoid membrane along the lower border of the hyoid bone. The incision divides the skin, the superficial fascia, inner half of the sterno-hyoid muscles, the membrane itself, and the mucous membrane, between the base of the tongue and epiglottis. The epiglottis is seized and drawn through the wound, and the growth is removed in such a manner as appears most suitable to the individual case. The length of the incision and the structures which are divided vary according to the size and situation of the tumour. The vessels wounded are usually few in number and of very insignificant size. After the operation, the edges of the wound are brought together, and healing may take place by the first intention.

I am strongly of opinion that all growths of the sides and back part of the larynx can be better exposed and removed by division of the thyroid cartilage (thyrotomy) than by supra-hyoid laryngotomy; and I believe that the epiglottis can be better dealt with by thyrotomy.

Infra-thyroid Laryngotomy is practised for those cases in which the growth is situated on the under aspect of the cords or actually below the cords. I am not in the habit of employing it, because I believe that thyrotomy, with an extension downwards of the incision, serves the purpose better. By this means I have removed tumours an inch below the vocal cords, and for those which lie immediately below the cords there is no necessity to practise even a modification of the ordinary operation of thyrotomy.

Thyrotomy has during the last ten years been performed much more frequently than any other operation for the removal of malignant disease of the larynx in this country, and has steadily grown in repute during that period. It is peculiarly applicable to sarcomas and carcinomas of intrinsic origin. As I, in conjunction with my friend, Sir Felix Semon, am largely responsible for the introduction of it into this country in cases of malignant disease, and for such modifications in the after treatment as have served to render it far less fatal than it used to be, I shall describe the manner in which I am in the habit of performing the operation.

The patient is anæsthetised, the shoulders and neck are raised, and the head is thrown back. The skin is prepared as for any other operation. An incision is made from the hyoid bone down almost to the sternum in the middle line, and the structures are divided right down to the thyroid cartilage and the trachea, including, generally, the isthmus of the thyroid gland. The vessels, for the most part veins, are clamped. The trachea is freely opened below the cricoid cartilage and Hahn's tube, with its sponge covering, is introduced. Thus ends the first part of the operation, for ten or twelve minutes must be allowed to elapse before the larynx is opened in order to allow the swelling of the sponge completely to occlude the trachea, and thus prevent the descent of blood and other liquids into the air-passages. During this interval the clamped vessels should be ligatured, and the upper part of the wound should be kept covered with gauze.

At the expiration of the ten or twelve minutes the thyroid cartilage is split in the middle line, from below upwards. This is important, for, as the cartilage is generally calcified and requires the use of bone-forceps, the inner blade of the forceps, working from above downwards, may slit or detach one of the

vocal cords at its anterior extremity. If the growth proves after all to be innocent, and does not call for the removal of any part of the vocal cords, such an accident results, almost certainly, in permanent injury to the voice. The crico-thyroid membrane is divided down to the cricoid cartilage, and the incision is carried up beyond the level of the upper border of the thyroid cartilage in order to gain as much space as possible, but it is desirable not to interfere with the attachment of the epiglottis, unless the situation of the growth makes this imperative. The two alæ of the thyroid cartilage are held widely apart by means of silk threads passed through each, the interior of the larynx is sponged out dry, and is then brushed with a twenty per cent. solution of cocaine. The oozing of blood soon ceases, when the interior of the larynx is very carefully examined, generally by reflected light with a mirror on the forehead, and the extent and exact situation of the disease are made out. An incision is carried around it with knife or scissors, including more than half an inch of the surrounding apparently healthy tissues, without respect to the after use of the voice or any other consideration except the complete removal of the disease. The included area is cut out right down to the cartilage, which is laid bare and finally scraped absolutely bare with Volkmann's sharp spoon. The cavity is plugged with iodoform gauze, upon which pressure is made for two or three minutes. By this means the bleeding, which is never serious, is checked. The gauze is then removed, and the surface dusted with powdered iodoform. I have not used the galvano-cautery to the interior of the larynx for some years past, and I have never seen bleeding which could occasion the least anxiety. If a small vessel spouts, it should be ligatured with the finest catgut. The alæ of the thyroid cartilage are now brought together with a couple of silk or silver sutures, and are as carefully apposed as possible; the Hahn's tube is taken out, and the edges of the wound in the soft parts are brought together, except at the lower part where the tube was inserted. I think it much safer to leave this part open, in order to provide for the ready escape of blood and other liquids from the larynx and trachea, and to guard against cellular infiltration underneath the skin. In order to hasten the convalescence, some operators have lately closed the entire wound. But I am very much opposed to such a

practice, which aims solely at shortening what is really a very short after-treatment, and does so with decided risk to the patient.

I have devoted considerable attention to the after-treatment of these operations, which is now conducted on the following lines: Hahn's tube is removed as soon as the operation is concluded, and no tube is employed in its place; the wound is covered with a piece of mercurial or iodoform gauze, and this, which is kept in place by means of a single turn of bandage, is changed by the nurse as often as it is soiled. The patient is placed on his side, with only a single flat pillow for the head, which is placed well forwards, so that all liquids have a tendency to pass out of the air-passages, especially through the external wound. During the day of the operation nothing is swallowed, although fragments of ice may be kept in the mouth for the comfort of the patient. If there is fear of collapse and the patient is feeble or very old, brandy and beef-tea may be administered by the rectum. On the following morning the first attempt is made to swallow. The patient leans far forwards, with the head down, and the dressing is taken off the wound, beneath which a basin is placed. Cold water is drunk out of a glass. If the experiment is successful, all the water passes down into the stomach. If it is only partially successful, some escapes into the larynx. But the posture of the patient ensures that it runs out through the wound and does not pass into the air-passages. As soon as water can be readily swallowed, milk, beef-tea, and other liquids may be drunk, for the fear of "Schluckpneumonie" is practically at an end. The wound is generally closed within ten or twelve days of the operation, and the patient is rarely confined to the house for more than ten days.

This description applies only to those cases in which the disease is limited to the soft parts of the larynx, and is of small extent. In other cases, the operation may need to be modified even to the extent of removal of a large part or the whole of the framework of the larynx. Or the operator may find, on examination, that the patient is not likely to be benefited by an attempt to remove the disease, and may then decide to abandon the operation, contenting himself, perhaps, with introducing an ordinary tracheotomy tube for permanent wear.

Iodoform powder may be insufflated into the larynx during

the first days after the operation, either through the mouth or through the wound by means of an insufflator with a bent nozzle.

Excision or extirpation of the Larynx (*Laryngectomy*) was first performed by Billroth in the year 1873. Since that date the operation has been many times practised, so that Sendziak was able, two years ago, to put together 188 cases of total removal of the larynx for cancer, and might have used a larger number had the reports been sufficiently full for his purpose. But while thyrotomy has been steadily growing in favour during the last eight or ten years, total extirpation has been less frequently practised. Again, thyrotomy is *the* operation of the English school, while extirpation is largely practised by the German school of surgery. Between 1881 and 1888, according to Sendziak (*Die bösartigen Geschwülste des Kehlkopfes*, Wiesbaden, 1897), 110 total extirpations were performed. Between 1888 and 1894 only forty-seven. I may presently be able to show the reason for this falling-off in the number of operations.

Tracheotomy is performed either at the time of the extirpation or some time previously, according to the condition of the patient and the views of the operator, and Hahn's tube is almost universally used during the performance of the operation itself. The position of the patient is the same as for thyrotomy, and a similar incision is made. But as more space is usually required, the vertical incision is often supplemented by a transverse incision across the thyro-hyoid membrane, just below the great cornua of the hyoid bone. The flaps are turned back, and in some cases the sterno-mastoid muscles are partly divided. This is not necessary unless the disease has extended into the surrounding structures, or the glands are to be removed. It is better to open the larynx before determining the extent of the operation, although some operators object to the practice on account of the greater difficulty afterwards in removing the larynx. But it is so important to be sure of the extent of the disease before proceeding to perform extirpation, that this consideration overbalances any disadvantages which arise from the splitting of the thyroid cartilage. If the disease is quite limited to the soft parts, yet of large extent, the operation may be restricted to the very free removal of the affected tissues, with a wide area of the surrounding healthy structures. And this may do as much for

the patient as would be accomplished by removal of any part of the framework of the larynx. If the disease is limited to one half of the larynx the operation of partial excision may be performed and the healthy side of the larynx may be left. Also in cases in which it is deemed expedient to remove the entire larynx, the operator may judge from his inspection of the disease whether the epiglottis and the cricoid cartilage should also be taken away. The actual removal of the larynx may be practised from below upwards or from above downwards, according to the views of the operator. But whichever method is preferred, it is of the utmost consequence that the knife or scissors should be kept close to the larynx in order to avoid wounding the large vessels and nerves which lie beside it. And if the cricoid cartilage and upper rings of the trachea are removed, the same care should be exercised to avoid opening the œsophagus. At the same time, in cases which are complicated by extension of the disease into the surrounding parts, the real object of the operation—the free removal of the disease—must never be lost sight of. Involvement of the surrounding parts and affection of the glands largely increase the danger of the operation and the gravity of the prognosis. Vessels are clamped as, or before, they are divided and are afterwards tied.

Some operators retain Hahn's tube for two or more days after the extirpation. Others remove it earlier, and replace it with an ordinary full-sized tracheotomy tube. The common practice is to tampon the wound with gauze, generally iodoform, and this may be necessary in cases in which the entire larynx has been removed. After removal of half the larynx I have not found it necessary, unless it be for the first day, in order to check undue oozing from the surface of the tolerably large wound. The wound is generally left open, and may thus be easily treated by such applications as are preferred. I usually employ iodoform. The patient is fed during some days through an india-rubber tube, which may either be permanently maintained as long as it is necessary, or may be passed for each feeding. At the end of three or four days an attempt is made to swallow. The same posture and precautions should be taken as I have described in the paragraph on thyrotomy, but soft solids, such as jelly, are generally more easily swallowed than liquids.

Various modifications of this method may be practised. Solis Cohen's is one of the most interesting and important. The trachea is brought forwards and stitched to the lower part of the skin wound, and the soft parts are brought together above and behind it. A description of the operation, with a sketch of the patient (who was brought over to England from Philadelphia and exhibited to the Annual Meeting of the British Medical Association in London in 1895), is to be found in the *British Medical Journal* (1895, ii. 1100). In this case the patient could swallow with perfect comfort, and there was no necessity for an artificial larynx, which would, indeed, have been impossible. He could speak through the open mouth of his trachea so distinctly that he could be heard and understood at the end of a long room.

Results of Operations.—*Mortality due to the Operation.*—The mortality differs enormously according to the operation which is performed, and also according to whether it is performed for intrinsic or extrinsic disease of the larynx. Among the many publications which have appeared since the first edition of this book, that which I believe contains the largest number of collected cases is Sendziak's (*loc. cit.*). The material is collected from public and private sources, and Sendziak has expended an immense amount of labour upon the analysis of it. Unfortunately, he has not quite grasped the importance of a separation of the intrinsic from the extrinsic carcinomas, and does not realise that the practice of this country especially, and to a less degree of the United States, is based upon the vast difference in the pathology of laryngeal carcinoma, according as it arises from the intrinsic or the extrinsic parts of the larynx. And, further, he has not attached sufficient weight to the improvements which have taken place during the last ten years. Some of the most important issues, according to the idea of English and American laryngologists, are, therefore, so confused that it is impossible thoroughly to unravel them, even with Sendziak's tables at hand. However, I shall do what I can to place the most important matters in so clear a light as to be useful to operators for malignant disease of the larynx.

The conclusions at which I arrived from a study of the disease and the operations which had been performed for its removal in 1883 (*Malignant Disease of the Larynx*), and in

1887, when the first edition of this book was published, were so gloomy that there seemed to me at that time to be scarcely justification for the performance of a radical operation for carcinoma. Scarcely a single case had been cured by partial extirpation, and the operation was dangerous to life, while the mortality due to complete extirpation of the larynx was extremely large, and the successes were "surprisingly small." Moreover, the condition of the patient after complete removal of the larynx was far from enviable. I should, twelve years ago, have wholly condemned radical operations for carcinoma had it not been for several circumstances which seemed to justify further experiment. In the first place, partial extirpation had not been excessively fatal, and it left the patient in a thoroughly comfortable condition. In the second place a study of the pathology of the disease led me to believe that Krishaber's division of carcinoma of the larynx into those of intrinsic and those of extrinsic origin was of considerable value from a pathological point of view. On the strength of this view, I ventured to suggest that "in the immediate future extirpation of the larynx for carcinoma should be practised only for *intrinsic* carcinoma which is still limited to the larynx." My friend, Sir Felix Semon, accepted this suggestion, and we have been intimately associated, ever since that time, in working out to a successful issue the treatment of intrinsic carcinoma of the larynx by operation. The first case which appeared to Semon suitable for operation was treated by Hahn (of Berlin); the second case by myself; and a number of cases since then by Semon and by myself. The operations practised in the two first cases were removal of one half of the larynx. But nearly all the later operations have consisted in opening the larynx and freely cutting out the disease with a wide area of the surrounding apparently healthy parts (just as one would cut out an epithelioma of the lip), so much so, that the operation of thyrotomy has come to be regarded as the English operation for cancer of the larynx, and Sendziak says that I, personally, have performed one-fifth of all the thyrotomies which are on record in medical literature for cancer. The reasons for the gradually limiting of the operation to thyrotomy are—the little liability of the disease to infiltrate the cartilage of the larynx, whether it is calcified or not, the resemblance of the course of intrinsic carcinoma to

that of cancer of the lip, and the great improvement which has been made in the early diagnosis of the disease, which is in large part due to the work of Sir Felix Semon. I hope the results which I shall describe will help to further popularise an operation which, when adapted to suitable cases, is certainly marvellously successful.

Sendziak reports nine deaths in ninety-two thyrotomies performed for cancer, four of which occurred from pulmonary complications, three from sepsis of one kind or another, one from syncope, and one from failure of the heart. Of course the large majority of these operations were performed for carcinoma of intrinsic origin, but the list comprises operations also for extrinsic carcinoma; and as these operations are decidedly more dangerous to life than those which are performed for intrinsic carcinoma, the mortality is by no means excessive. Semon and I performed up to the end of July 1896 seventeen thyrotomies (on sixteen patients) for intrinsic carcinoma with two deaths, one due to sepsis, the other to bronchitis, so that our mortality appears at first sight larger than that of the series of cases collected by Sendziak. But since August 1896 neither of us has lost a patient from the operation. Indeed, my last fatal case was in 1889, and Semon's was in 1894, from bronchitis, which had existed before the operation. Further, since July 1896 we have performed ten or more operations for intrinsic carcinoma without a death, so that we now have a long series of cases of thyrotomy for intrinsic carcinoma, unbroken by a single fatality. Nor is this due to mere accident or good fortune. It is the result of improvements which have been made both in the manner of performing the operation and, still more, in the after treatment. The immediate removal of Hahn's tube, the frequent changing of the loose dressing which is placed over the wound, and the care which is expended on the feeding of the patient have effected a most salutary change in the prospect of recovery from the operation. Sendziak regards a mortality of ten per cent. as extraordinarily small, but I feel quite certain that 100 thyrotomies ought to be performed at the present time for intrinsic carcinoma with a mortality of three or four, perhaps even less than this.

Of partial extirpation of the larynx for carcinoma I have had a very small personal experience, for I have only performed

it three times, and in each case for intrinsic carcinoma. Sendziak has put together 110 cases, with a mortality from the operation of twenty-nine, so that the percentage is 26·3. It is therefore nearly three times greater than that of thyrotomy. Twenty-two of the patients died of some kind of affection of the lungs, for the most part septic, six of collapse or paralysis of the heart, and three of hæmorrhage. Sendziak considers that this percentage proves decidedly that partial resection of the larynx is in no case to be regarded as a dangerous operation! Surely a mortality of more than one-fourth is extremely large for such an operation. If the table from which these deductions are made is examined, I cannot but think that the mortality is much larger even than Sendziak has stated. Indeed, I make more than thirty-two deaths, and his own list of the causes of death makes the total thirty-six, unless several of the cases are placed under more than one heading. I feel sure that this is a larger mortality than ought to follow removal of not more than one half of the larynx. And there is reason for this more favourable view in the far smaller mortality in the last sixty cases (performed during or since 1888) than in the first fifty. The percentage of mortality is almost twice as large for the first fifty cases. This is only what might fairly be expected from the improved methods which have been employed, not only in the performance of the operation, but in the after-treatment of the patient.

Total extirpation of the larynx is an exceedingly dangerous operation. Sendziak finds eighty-four deaths in 188 cases, and rates the mortality at 44·7 per cent. Of course it must be taken into account that many of the operations were much more extensive than the mere removal of the larynx, and were carried into the neighbouring parts, such as the muscles, the pharynx, and the lymphatic glands. But as future laryngectomies are likely to be quite as extensive, it is doubtful whether any allowance should be made on this account. But in this case, again, the later mortality is much less than that which followed the earlier operations. For example, fifty-six of the 184 operations were performed during or after 1888 with only eighteen deaths. Had the mortality been equal for the entire series, there should have been twenty-five deaths, so that the relative mortality is very largely diminished. In

spite of every care, and in the best hands, however, I am afraid the operation of laryngectomy will always be attended by a high rate of mortality. Nearly forty of the patients died of affection of the lungs, almost invariably pneumonia, and generally septic pneumonia, and no fewer than seventeen of the deaths were due to collapse and paralysis of the heart. Whether this grave complication of paralysis of the heart is due to division of the nerves which restrain the action of the heart or to continued irritation of the superior laryngeal nerves, there seems at present to be no sure means of providing against it.

In spite of his activity and industry, Sendziak has only been able to collect thirty-three operations for sarcoma of the larynx, and these were performed on thirty-one patients, for the earlier operation of thyrotomy or partial resection was followed in two cases by total extirpation of the larynx at a later period. Twelve thyrotomies were performed without a fatal result. But there were three deaths in ten partial excisions, and three deaths in eleven total extirpations. There is, therefore, no longer any necessity to consider the operation separately for sarcoma and carcinoma so far as the immediate danger of the operation is concerned.

Cures due to Operation.—It will be convenient to take the cases of *sarcoma* first, in accordance with the method which was pursued in the first edition. One of the twelve patients on whom thyrotomy was performed was well and free from disease four years after the operation, which was performed for the removal of three nodules of "sarcoma," one at the anterior part of the right false cord, two below the cords. None of the other patients can be claimed to have been cured, but four of them were well two years, or nearly two years, after the operation, and two other patients were well a year after the operation; while recurrence of the disease is only noted in two of the twelve cases.*

The results are very different for the ten cases of partial excision of the larynx. One patient was well four years after

* I have since learned that Semon's patient, who was reported to be alive and well seven months after the operation, was free from any sign of recurrence of the disease nearly five years after it was performed. This, therefore, ensures two thoroughly successful cases out of the total of twelve.

the removal of a round-celled sarcoma of the left true and false cords by Bull (America). Three patients died of the operation. Three died of affection of the lungs (apparently not malignant) at periods of three months, twelve months, and eighteen months after the operation, and without any sign of recurrence of the disease. One patient suffered from immediate recurrence of the disease, for which total extirpation of the larynx was successfully performed by Küster, and one died of recurrence two and half years after operation. And the remaining patient was still well about a year after the operation. The total laryngectomies furnish really better results. For while three patients died of the result of the operation, three were well at periods of seven, eight, and fifteen years respectively after operation. But four persons died of recurrence of the disease, and the remaining patient was only under observation for a period of three months. The results of the thirty-three operations can scarcely be called good from any point of view; but they are not bad, because, in addition to the really successful cases, there are several in which there is reason to hope that the result may prove quite successful. The successful laryngectomies were performed for three varieties of sarcoma, one round- and spindle-celled, the second "lympho-sarcoma," and the third "sarcoma carcinomatodes."

I now come to the results, as far as cure of the disease is concerned, of operations for the removal of *carcinoma;* and in this matter shall have to draw pointed attention to the different conclusions which are to be derived from a study of Sendziak's tables and from a study of the thyrotomies which have been performed during the last ten or more years in this country.

Sendziak finds that eight patients out of the total number of eighty-five were alive and well for more than three years after the operation. As eight of the eighty-five were lost sight of shortly after the operation, they must be left out of the account, so that the total is reduced to seventy-seven cases, with eight cures, just over ten per cent. But no division is made between the operations for intrinsic and extrinsic disease, which we, in this country, regard as essential, and the great difference in the earlier and later cases is not emphasised. Thus, six of the eight successful operations were performed during or after 1888, and the six contained three of my own

cases and one of Semon's; so that we are responsible for one half of the total eight successful cases. Up to the end of 1896 Sir Felix Semon and I had performed thyrotomy for intrinsic carcinoma on sixteen patients, and ten of the patients were alive and free from the disease for at least three years after the operation. The results in the cases which we have treated by operation since that time bid fair to be quite as successful, particularly as we have thus far no death to record from the operation itself. But sufficient time has not yet elapsed to allow us to claim any of the patients as "cured." Our results thus far have been achieved by early diagnosis, and by limiting the operation very strictly to the most suitable cases of carcinoma of intrinsic origin. In our desire to operate early, we have, each of us, opened the larynx in more than one case in which the disease was of doubtful nature, and the diagnosis could not be cleared up by the removal of a fragment through the mouth for microscopical examination. When the disease has been discovered to be innocent, the larynx has been closed at once, and no harm has resulted. On the other hand, we have perhaps erred somewhat in declining to operate in advanced cases of laryngeal cancer, and have seldom operated for carcinoma of extrinsic origin. Naturally, as a general surgeon, I have operated several times on more advanced cases of intra-laryngeal cancer, and have performed partial removal of the larynx. But my desire to place the operation of removal of laryngeal carcinoma on a sound foundation has made me very conservative in this respect. Now that this has been achieved, and surgeons in this country and America are quite ready to advise and perform operations in suitable cases, I am disposed to widen my range of laryngeal surgery, and to undertake partial laryngectomy much more frequently than I have hitherto done.

The principles on which the operation of thyrotomy for carcinoma have been performed in this country seem scarcely to have been grasped by most of the Continental surgeons. Those principles are that carcinoma of intrinsic origin is, in the earlier stages, almost always a disease of limited malignancy, with scarcely any disposition to affect the lymphatic glands, and no tendency to be disseminated. Also, that it involves the framework of the larynx with difficulty, so that

even when it is seated almost on the surface of the cartilage, it is seldom necessary to do more than cut away the face of the cartilage. Recurrence in the soft tissues is the one great fear, and the operation should be directed to avert local recurrence in the soft parts. These are the principles on which we have worked, with the success which has just been described. In Germany and in Switzerland it appears to me quite certain, from what I have heard and read, that the conditions of malignant disease which we have treated successfully here by means of thyrotomy have been usually treated by a much larger operation. Such an operation seems not infrequently to have resulted in stenosis, with the necessity for tracheotomy at a later period and the permanent wearing of a tube.

In this relation Rutsch's account of Professor Kocher's operations (*Deutsche Zeitsch. f. Chir.* Bd. L. 481 Feb. 1899) is extremely interesting. It comprises only the larynx operations since 1890, and the radical operations are twelve in number. The results are very indifferent. For, whereas one patient died of the operation, and another patient, who was phthisical, died of pneumonia six weeks after the operation, only one of the twelve patients can be claimed as a success, a man who was alive and well four and a half years after removal of a cancerous epiglottis by sub-hyoid pharyngotomy. Five patients were free from recurrence at periods of five, six, seven, ten months, and two and a half years respectively. The remainder had died of recurrence of pneumonia, for the most part within a few months of the operation. Fortunately, there is a very reasonable hope that several of these cases will prove to be eventually quite successful. Two facts strike me in the study of Rutsch's paper: the absence of any division of the cancers into intrinsic and extrinsic, and the occurrence of stenosis in several cases when the operation was limited to the removal of a part or one half of the larynx. I cannot understand why the removal of half the larynx should necessitate the permanent wearing of a tracheotomy tube. Rutsch attributes the better doing of some of the patients to the fact that they belonged to the wealthier classes, and the diagnosis had been made at an earlier period of the disease. He predicts, for the same reasons, a better final result in these cases. I should do so too, but for quite another reason, namely, that the disease in

all five of the patients who were well from five to thirty months after the operation was of *intrinsic* origin.

Sendziak finds that ten successes are to be claimed on the table of 110 partial laryngectomies; but the total may be diminished by deducting some fourteen or fifteen cases in which the observation of the case lasted less than a year or the patient died within three years of some other cause than cancer of the larynx and glands. The proportion of successes is, therefore, even after this deduction, very small, about the same as was procured by the operation of thyrotomy. It is here of great importance to examine the class of cases in which success was obtained. Seven of the cancers were certainly of intrinsic origin, and only one of them certainly extrinsic (ary-cartilage); while in the two remaining cases the disease was probably, but not certainly, intrinsic.

The 188 total laryngectomies may be reduced to about 170 by the exclusion of the same kind of cases as have been excluded in considering the other table; and there are eleven successes to be claimed. Among the excluded cases, it is wonderful how many are to be excluded on account of death from pneumonia or bronchitis within three or four months of the operation. The proportion of cured cases is lamentably small, while the mortality of the operation is exceedingly large. It is not possible to judge of the extent or origin of the disease in most of the successful cases, but it appears generally to have been very extensive, and is more than once spoken of as filling the cavity of the larynx. On the other hand, the description of the disease in many of the 188 cases would lead to the belief that total laryngectomy was a much larger operation than was needed, and that the conditions of the case might well have been met by partial laryngectomy or even by an extensive thyrotomy. As might be expected, the results of the cases during and since 1888 are a little better than those of the cases before 1888. I have already shown that the death-rate due to operation is less. And of the fifty-six patients alive and free from disease four were alive and free from disease more than three years after the operation. This result is, of course, very poor; but there is a reasonable hope that it may really be better in the fact that fifteen patients had been lost sight of, or had only been observed for a few weeks or months after the operation.

Are patients who are not cured relieved by the Operation?—Patients on whom thyrotomy or partial extirpation of the larynx has been performed are usually perfectly comfortable in every respect. They are not obliged to wear a tube, can swallow well, and can speak in a gruff whisper. So long, then, as there is no recurrence of the disease, they are absolutely relieved by the operation, but the voice, of course, is not improved by the operation, although it may be quite as good after it as it was for some time previously.

Patients who have suffered total extirpation of the larynx, particularly when the operation has been extended into the surrounding soft parts, are often in a miserable condition. In some cases there is difficulty in swallowing. All of them need to wear a tracheotomy tube, unless the trachea is fastened to the opening in the integument, as in Solis-Cohen's case. And the artificial larynx is much more troublesome to wear and manage than is usually thought. Further, I cannot doubt that these patients are much more liable than other persons to pneumonia and other affections of the lungs.

Conclusions.—Endo-laryngeal operations are only indicated in those cases in which the disease is very limited in extent, very superficial, and in which there are very urgent reasons against opening the larynx.

Thyrotomy is *the* operation for all cases of intrinsic carcinoma, in which the disease is limited to the interior of the larynx. It is seldom necessary in such cases to remove any of the framework of the larynx, unless the disease is situated at the back of the larynx. It suffices to scrape or cut away the face of the cartilage beneath the base of the disease. In those rare cases in which intrinsic carcinoma is associated with affection of the cervical glands, it is better to remove the glands by a separate operation.

Thyrotomy is, to my mind, a safer and more satisfactory operation than the various modifications of pharyngotomy for the removal of cancer of the epiglottis and ary-epiglottic folds, &c. It allows of better exposure of the disease and of greater certainty in dealing with it; and it appears to be less dangerous to life.

Partial excision of the larynx, either of one half, or an atypical operation adapted to the extent and character of the disease, is suitable to cases in which the disease is of greater

extent than could be dealt with satisfactorily by thyrotomy and removal of the soft parts. It is also indicated in those cases in which recurrence has followed rapidly on a carefully executed thyrotomy.

Total extirpation of the larynx is very seldom performed in this country, and is losing favour in other countries. If the disease is too extensive to be treated by partial laryngectomy, the prospect of success from an operation is exceedingly bad. The operation itself is very dangerous to life. The patient is much more liable after it to affections of the lungs, particularly to fatal pneumonia; and the mutilation caused by the operation is often so considerable that the patient's lot is very unenviable.

The operations which are suitable for the removal of carcinoma are equally suitable for the removal of sarcoma.

The most promising cases of carcinoma for operation are those in which the disease is of intrinsic origin, situated on the vocal cord, near its anterior end, and is of small extent, and not deeply fixed. And the best patients are those who are otherwise in good health, and particularly those who are not subject to bronchitis. Sarcomas of small size and of intrinsic origin are probably equally promising for operation.

Cancers of extrinsic origin are always much less favourable for operation. The mere removal of the disease is more dangerous to life: while the greater local malignancy of the disease, and the early disposition to affect the lymphatic glands, render the prospect of cure very remote.

I believe, in these cases, it is better to limit the operation to the larynx, and to remove the lymphatic glands, if they are enlarged, through a separate incision two or three weeks after the removal of the cancer of the larynx.

CHAPTER XVII

THYROID

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Malignant disease of the thyroid gland is, in this country, a somewhat rare affection. It is fortunate that it is rare, since in the stage at which it is usually seen by operating surgeons it is seldom amenable to surgical treatment.

The disease may occur in a gland that has previously been normal, but it is much more prone to affect one that has already been the seat of innocent goitre. This is doubtless the reason why it is most commonly seen in localities where ordinary goitre is prevalent. Even in cases in which there is no history of pre-existing goitre it will often be found, upon examination after removal, that the tumour contains cysts, points of calcification, or some similar evidence of former disease. In several cases, however, which have come under my own notice in museums and elsewhere, evidence of the previous existence of a goitre has been wholly wanting.

The disease is essentially one of advanced life, being rarely seen below the age of forty. Among thirty-one specimens of malignant disease of the thyroid in the London museums, there are but two from patients below the age of thirty-nine.

The disease occurs with almost equal frequency in the two sexes. Of thirty-six specimens in London museums sixteen are from male and twenty from female patients.

Both carcinoma and sarcoma occur in the thyroid gland. The former is usually of the alveolar form with cubical or cylindrical cells, the latter either spindle- or round-celled. Other rare varieties have occasionally been described, but are not of sufficient importance to require further consideration here.

It is exceedingly difficult to arrive at a definite conclusion as to the relative frequency of sarcoma and carcinoma. Of fifty-one specimens in the above-mentioned museums, seventeen are sarcomatous and thirteen carcinomatous; while of twenty-one it is impossible to express a definite opinion, owing to want of proper microscopical examination. Among fifty undoubted cases found in literature published since 1884, I find twenty-six sarcomas and twenty-four carcinomas.

Clinically it is very difficult to distinguish between sarcoma and carcinoma. In most cases it is not possible to do more than guess at the probable nature of the morbid growth. I shall therefore treat of them together, merely prefacing my remarks by saying that if the tumour has grown very rapidly and is limited to one lobe of the gland, the disease is more likely to be sarcoma; while if the affection, at a comparatively early stage, involves both lobes and pursues a somewhat slow course, it is not unlikely that it will prove to be carcinoma. Exceptions to both these rules are, however, by no means uncommon.

In the earliest stages, while the growth is still confined within the capsule of the gland, there are no means by which we can make a certain diagnosis of malignant disease. When, however, in the thyroid gland of a person over forty a tumour appears which is hard, which steadily and rapidly increases in size, and which is not of an inflammatory nature, the malignancy of such a tumour should be strongly suspected. If, moreover, the surface of the tumour is irregular and bossy, and if there is likewise dysphagia, and pain in the neck, shooting up to the side of the head or to the shoulders, then the diagnosis becomes almost a certainty. It is of the utmost importance that the diagnosis should, if possible, be made at an early period, since it is then alone that operative treatment can be adopted with a reasonable prospect of success. A little later, when the growth has penetrated the capsule and begun to involve surrounding structures, various other signs appear which make the diagnosis much less difficult.

The vocal cord on the corresponding side often becomes paralysed, a condition rarely produced by innocent goitre.

Involvement of the trachea with penetration of the growth into its lumen is very common, and is abundantly illustrated by specimens in museums. This penetration of the trachea is

most common at a point about half an inch below the cricoid cartilage, and often takes the form of a prominent, sometimes even pedunculated, button of growth. It occurs both in sarcoma and carcinoma.

Involvement of the muscular wall of the pharynx or œsophagus is very common, but actual penetration of its mucous membrane is rare.

On the outer side the growth tends to become adherent to the carotid artery and internal jugular vein. The relation of the carotid to the tumour may afford valuable evidence of malignancy. An innocent goitre in its growth usually displaces the artery outwards and backwards; a malignant tumour tends to infiltrate, to overlap, and surround it, without causing so much displacement. The artery can often be traced, by its pulsation, running as far as the tumour, into the interior of which it seems to disappear.

Paralysis of the sympathetic, shown by a contracted pupil and narrow palpebral fissure is not uncommon.

Fixity of the tumour is an important and very bad sign. It is well to bear in mind that a malignant tumour that has not yet become fixed to such immovable structures as the sternum, clavicle, and vertebræ, or the larger muscles of the neck, may follow the movements of the larynx and trachea with tolerable freedom, and yet may be hopelessly incorporated with the latter or with the wall of the pharynx. Many a time has an operator, deceived by this apparently free mobility of the tumour, been led to undertake an operation for its removal, only to find when too late that the adhesions on the inner side were so extensive that complete removal was impossible.

Involvement of skin and lymphatic glands afford but little help in the diagnosis. The skin is seldom involved, even in late stages, except in those cases in which the growth has been punctured or incised. Out of more than twenty cases that have come under my notice during life there was not a single one in which affection of glands afforded any material help in the diagnosis. By the time enlargement of the glands can be detected the nature of the disease is usually sufficiently obvious. It should be remembered that the glands first affected are usually very deeply seated, at the root of the neck or behind the sternum, where their detection is well nigh impossible. In many cases, especially of sarcoma, affection of

lymphatic glands is wholly absent, even in the latest stages of the disease.

Expectoration of blood is an unusual symptom ; it generally occurs late, and is of grave import, indicating probably penetration of the trachea or possibly secondary growths in the lungs.

The course of malignant disease of the thyroid is usually very rapid. Rose of Berlin has estimated that the extreme limits of its duration are nine weeks and eighteen months, and in the main this estimate is certainly correct. Many cases run their whole course within six months. On the other hand, there is no doubt that some cases last considerably longer than eighteen months. I have myself seen a patient in whom the disease had already lasted more than two years. The tumour had then attained the dimensions of an emu's egg. The patient died four months later ; no operation was performed.

Death is usually caused, both in sarcoma and in carcinoma, by extension of the primary growth to the air-passages. The mechanical obstruction of the trachea thus produced may cause fatal dyspnœa. The ulceration into the trachea may set up in the tumour septic processes which rapidly lead to the death of the patient. Bronchitis or pneumonia, septic in origin, is frequently the immediate cause of death, especially if tracheotomy has been performed. Penetration of the numerous large veins in and around the tumour, especially in the case of sarcoma, frequently leads to the occurrence of secondary growths in the lungs. Secondary growths in more distant viscera may occur. The bones especially are liable to become the seat of secondary carcinomatous growths. Some of these secondary growths show a remarkable tendency to reproduce the structure of the thyroid gland itself.

Sudden hæmorrhage into the softened interior of the growth may be mentioned as an occasional cause of death. It is well also to remember that in the later stages œdema of the glottis may supervene very rapidly and be the immediate cause of death.

A few words may be said here about certain forms of malignant disease which deviate from the ordinary type. Instead of being hard, the tumour may present itself in the form of a soft swelling which is then easily mistaken for a cyst or for an inflammatory swelling. Sometimes the whole gland quickly

becomes the seat of a rapidly growing soft tumour. Such cases, when occurring in young subjects, may be mistaken for the common, rapidly-growing parenchymatous goitre of adolescents. Cases described as sarcomata have been recorded by Boeckel and Tillaux, in which the tumours gave rise to many of the symptoms of exophthalmic goitre, for which, indeed, they were mistaken.

There are, moreover, certain forms of malignant tumour which must be classed among the carcinomas, although clinically their course is very different from that of the ordinary carcinoma. Such are the so-called "malignant adenoma" and the papilliferous cyst.

The former, although showing little or no local evidence of malignancy, tends, nevertheless, to reproduce itself in distant organs. It occupies an intermediate position between the innocent tumour and the more typical carcinoma.

Papilliferous cystic tumours, although rare are of much importance, since they grow slowly and exhibit but a low degree of malignancy. They are, therefore, far more amenable to treatment by removal even though they may have attained a large size. Mr. Barker has recorded a very remarkable case of this kind. The patient lived no less than eighteen years after the first appearance of the tumour and underwent in the last ten years of his life numerous operations for the removal first of the primary growth and then of locally recurrent tumours. The tumours, which were examined by a committee of the Pathological Society, were undoubtedly carcinomatous. Cases of a similar nature have been recorded by Berger, Wölfler, Sulzer, and others.

Methods of Operation.—Operations for the removal of a portion of a diseased thyroid may be divided into two main classes, that of extra-capsular *extirpation* and intra-glandular *enucleation*. In the case of malignant tumours, however, one only of these methods is suitable—namely, extirpation. An exception should, perhaps, be made for certain cases in which malignant disease attacks and is limited to an old adenoma with a well-marked fibrous capsule, but as these cases are rare and can scarcely be distinguished from those of innocent adenoma, the exception is rather apparent than real. The treatment of innocent thyroid tumours by enucleation is such a very satisfactory operation and is so widely applicable to them that attempt

have from time to time been made to treat malignant growths in the same manner. This is, however, in my opinion, a grave error. Not only is the hæmorrhage at times so profuse that the operation has to be abandoned on this account alone, but the removal is almost necessarily so incomplete that speedy recurrence must be expected. The only way to remove satisfactorily a malignant thyroid tumour is to do a careful and deliberate dissection and to avoid hæmorrhage by tying the main vessels before they are cut. The operator should at every stage of the operation be able to see exactly what he is doing. Otherwise he is liable either unnecessarily to wound important neighbouring structures or to leave behind portions of growths that might well have been taken away.

An operation for the removal of a malignant thyroid tumour should, if possible, be a thorough one and aim at the removal of the whole of the primary disease. When the disease is limited to the gland itself, this complete removal is possible. But unfortunately in the vast majority of the cases in which operations have hitherto been performed, this condition did not exist. The growth was found at the time of operation to have penetrated the capsule and to have involved the trachea, the pharynx, and the great vessels of the neck. In such circumstances it has been thought advisable to resect portions of these structures. But such complications naturally add enormously to the danger of the operation.

In most cases even after such resections the whole of the disease will be found not to have been removed and speedy recurrence takes place. The recurrent tumour usually grows much more rapidly than the primary one.

The operation for the removal of a malignant goitre in its early stage, that is before the capsule has been penetrated, should be performed in exactly the same manner as extra-capsular extirpation of an innocent goitre. An incision of sufficient length is made, usually over the long axis of the tumour, the infra-hyoid muscles are divided or pulled aside, and the capsule of the tumour exposed. Wound of the capsule with its network of large vessels should be carefully avoided. All the main vessels entering or leaving the gland are tied with double ligatures, just outside the capsule, before being divided. After the superior thyroid artery and the superior, lateral and inferior thyroid veins have been treated in this

manner, the tumour should be lifted up and the more deeply-seated inferior thyroid artery secured in the same way. This artery may be tied before it reaches the recurrent laryngeal nerve, or its branches may be secured on the inner side of the nerve just before they enter the gland. Great care must be taken to avoid wounding the nerve. The vessels at the upper and lower borders of the isthmus are secured with double ligatures, and the isthmus is then divided. The whole lobe is now freed from its remaining connections and removed. Ligatures are applied to any bleeding points. The cut surface of the isthmus should now be examined to make sure that the whole of the growth has been satisfactorily removed. If necessary, some more of the isthmus may be removed. It may even be advisable to repeat the operation upon the other half of the gland. Total extirpation of the gland is, however, in my opinion, rarely desirable. If both lobes are involved in the disease, the growth has almost certainly already involved the trachea and can no longer be satisfactorily removed. The simultaneous removal of both halves of the gland adds very much to the gravity of the operation. It should not, I think, be performed unless the operator feels confident that he can thereby make a complete removal of the whole disease and that he cannot do this by any smaller operation. It may reasonably be doubted whether the larger operations which include resection of organs outside the gland are advisable.

Irrigation of the wound with antiseptic lotions should, as far as possible, be avoided. Aseptic rather than antiseptic treatment should be aimed at. It is scarcely necessary to add that during the whole operation the most strict asepsis should be maintained. Drainage tubes, if employed, need seldom be retained for more than twenty-four hours.

The question whether an anæsthetic should or should not be administered is an important one. If severe dyspnœa be present at the time of operation then the administration of any general anæsthetic is certainly fraught with danger. In such a case the operation should be performed under cocaine anæsthesia. This can be done with much less discomfort to the patient than is perhaps generally known. I make it a rule now in operating for goitre not to give a general anæsthetic in any case where severe dyspnœa is present, and have on several occasions performed removal of large goitres in this way with a minimum of

discomfort to the patient. When no dyspnœa is present, there is, of course, no objection to the use of general anæsthesia.

Results of Operations.—*Mortality of the Operation.*—Accurate statistical information with regard to the removal of malignant thyroid tumours is not easily obtained. Most of the operators who have published long series of operations for goitre have omitted from their statistics all the malignant cases. In a few instances, however, a series of consecutive cases has been published, and these afford us valuable information. Such are the series published by Sulzer from the Canton Hospital at Münsterlingen (seven cases), by Bergeat from the Tübingen Clinic (six cases), by Hochgesand from the Heidelberg Clinic (five cases), and the latest series published by Kocher and performed by him and his assistants at the Berne Clinic (eighteen cases). Besides these I have collected from various sources thirteen isolated cases published by various authors* since 1887. With the possible exception of some of the cases mentioned by Sulzer, the exact dates of many of which I do not know, all these operations have been performed since 1884. Many of them, including all of Kocher's series, are quite recent, having been performed within the last few years. Five of the cases published by Hochgesand have been excluded from my statistics because they were performed before 1884, and have already been included in the series of fifty cases collected by Braun and Rotter, and published in the first edition of this work. I have excluded also cases of papilliferous cyst on account of its low degree of malignancy. The thirteen isolated cases include only those in which there was clear microscopical or other proof of malignancy.

Of the total number of forty-nine cases there were seventeen in which death occurred as the result of the operation itself. This gives us a mortality of thirty-four per cent., a distinct improvement upon the sixty per cent. of the earlier series.

Kocher's figures alone, which show six deaths among eighteen patients, indicate a great improvement upon the results of his earlier operations. They may be taken as representing the best

* Cramer, Frank, Petrakidès, Buschi, Berry, Jones and Battle, Lentz, Allen, Davis, Stonham, Ewald, Orcel, and Kummer.

results that can be obtained at the present day, when the operation is undertaken by a surgeon especially experienced in this branch of surgery, and who does not refuse to operate upon tumours that have already extended beyond the limits of the gland itself. It is the presence of severe complications encountered during the operation that makes the latter so fatal in itself, and which causes its mortality to be so very much greater than that of operations for innocent goitre.

Kocher's own remarks upon this subject are well worth quoting. Speaking in 1898 of the relatively high mortality in his series of eighteen cases, he says: "It is not the goitre operation in itself which leads to the fatal result, but the severe complications which the resection of neighbouring structures brings with it. In most cases it is necessary in removing a malignant goitre to excise at the same time portions of the trachea or œsophagus, or even the whole of the structures as far as they lie in the neck. Quite common in these operations are resections of the great vessels of the neck, most often the internal jugular vein, occasionally also the carotid artery. Important nerves, too, such as the vagus and sympathetic, must in many cases be wounded or resected. When these severe complications are taken into account, the healing of the wound in two-thirds of all cases of malignant goitre may be considered to be a comparatively favourable result, since the end of such patients, if they do not undergo any operation, is usually preceded by great suffering and distress, either from dysphagia or extreme dyspnœa. It is to be wished that every doctor could be brought face to face with such patients in the later stages of their malady, so that he might thoroughly appreciate the necessity of an early diagnosis and timely operative interference. . . . every goitre in an adult, and especially in an elderly person, that enlarges without obvious cause, should raise a suspicion of malignancy, even though it causes no pain or other trouble; and if at the same time the goitre becomes harder and irregular, and symptoms of increasing distress set in, then the diagnosis becomes almost certain."

Cures due to the Operation.—We may turn now to the ultimate results of the operation. From the thirty-two cases that recovered from the operation, we must deduct twelve of Kocher's, since with regard to them no further information has yet, so far as I can learn, been published. We must also

deduct six other cases, of which there was no history for more than, at most, four months. We are left, therefore, with the comparatively small number of fourteen cases. Of these, no less than eleven either died within a year or were known to have recurrence.

Three only were known to have survived, and to be free from recurrence for a period of three years and two months, two years and seven months, and eight months respectively—truly not a very encouraging list.

These three cases were:

1. A man, from whom in May 1889 the left lobe of the thyroid was extirpated on account of "round-celled sarcoma." When examined in July 1892 this patient showed no sign whatever of recurrence, and appeared to be in fairly good health, although suffering to some extent from thyroidal atrophy, symptoms of which had indeed been present before the operation. (Sulzer.)

2. A boy aged ten in whom a "hyperplastic" goitre was supposed to have become sarcomatous; there was slight dyspnœa. In July 1885 the tumour, which contained numerous cysts with hæmorrhagic contents (surely an unusual form of malignant disease of the thyroid!) was removed by what seems to have been an atypical enucleation operation. In February 1888 there was no recurrence, and the patient seems to have been quite well. (Hochgesand.)

3. A woman aged fifty-four, with a "malignant" goitre as large as a fist. There was much dyspnœa and dysphagia. In June 1887 the tumour was extirpated, the œsophagus being opened in the course of the operation. Five weeks later œsophagotomy was successfully performed for the close of the fistulous opening that was present. The patient made a good recovery and in February 1888 was reported to be in good health. (Hochgesand.)

In neither of the two last cases is it definitely stated that any microscopical examination was made.

The results of the operations given in the first edition of this book may be compared with the more recent statistics given above, in the following tabular form.*

* The two cases in which the operation was not completed have been omitted from the earlier series of fifty cases and the whole of Kocher's cases from the second series.

	Earlier Series	Later Series
Died of the operation . . .	30 (62 p.c.)	11 (35 p.c.)
Further history unknown . .	4	6
Known to have had recurrence or to have died within a year .	10	11
Known to have survived without recurrence for periods varying from eight months to two years and a half . . .	3	2
Known to have survived without recurrence for more than three years	1	1
Totals	48	31

These statistics show clearly that in the vast majority of cases the operation, as usually performed, does not result in a cure. It is much to be regretted that we have at present no reliable statistical information as to the results of operations undertaken in the early stages only, that is, before penetration of the capsule has occurred. These are the cases in which we might reasonably hope that the operation would be of much benefit to the patient. Cases in which a long period of immunity has followed an operation undertaken at this early stage are occasionally seen.

In the Philadelphia "Annals of Surgery" (1893, p. 554), is an account of a discussion at the New York Surgical Society on a case of malignant goitre. Dr. F. Kammerer was reported to have said that "of several total extirpations for malignant disease, he recalled two in which the growth had not perforated the capsule. One was a very large cancerous thyroid and there was no recurrence after extirpation for four years, when recurrence did take place and it ran a rapid and fatal course. In another case in which the diagnosis was established without doubt, the patient is still living without any recurrence, seven or eight years after total extirpation."

In answer to my inquiries Dr. Kammerer has kindly furnished the following important information. The first case was one of Maas's, already included in Rotter's statistics. The second case was that of a patient operated upon by Kocher in or before the year 1885.* In 1893 an operation for the first

* The exact date of the operation I have not succeeded in ascertaining, but it appears to be quite certain that it was not later than 1885, and was probably somewhat earlier.

recurrence was performed by Dr. Lange of New York under whose care the patient was for the next three years. Tracheotomy eventually became necessary, extensive recurrences took place, and the patient finally died in August 1896. Dr. Kammerer tells me that Kocher had stated that the tumour removed at the first operation was malignant. With regard to the recurrent tumour, I have a report from Dr. Schwyzer, pathologist to the German Hospital of New York, who made the post-mortem examination and who states that the tumour was a "tubular carcinoma with much interstitial connective tissue."

It seems clear, then, that this patient survived the removal of a malignant goitre for a period of at least eleven years.

The tumours known by the names of papilliferous cyst and proliferous cystic adenoma form a class of malignant tumours that stand somewhat apart from the ordinary sarcoma and carcinoma. They are much less malignant. They grow slowly and exhibit much less tendency either to infiltrate locally or to disseminate. In these respects they are analogous to the papilliferous cysts of the ovary, which they closely resemble. The patients are much less liable to speedy recurrence after operation.

In Barker's case already mentioned, the tumour had been growing for eight years before the first operation was performed and death did not occur until ten years later still.

Berger records the case of a woman aged twenty-six, in whom a large tumour of this nature had been growing for six years. It was then removed with some difficulty owing to its intimate connections with the internal jugular vein; eight months later this patient was well and had had no recurrence. Wölfler cites from Billroth's practice the case of a woman aged twenty-three, in whom the tumour at the time of operation occupied a large part of the neck. It had been growing for one year. Two years after the operation no recurrence had taken place.

Conclusions.—The operation for the removal of the ordinary forms of malignant disease of the thyroid gland, unless performed at a very early stage of the disease, is attended by a high mortality from the operation itself.

The danger lies chiefly in the involvement of important neighbouring structures, portions of which must frequently

be cut away if the primary disease is to be thoroughly removed.

The diagnosis of the earlier stages of the disease is difficult; it is especially difficult to say with certainty that the trachea and pharynx are not already involved.

If the disease has not already penetrated the glandular capsule the operation is not particularly difficult or dangerous, if the dissection is performed carefully and with due regard to the anatomical relations of the parts. Recurrence after operation is usually local and due to incomplete removal of the primary disease.

In the later stages of the disease, secondary deposits are likely to be found in the lungs and bones.

There are certain forms of slow-growing malignant disease, such as the papilliferous cyst, in which the tendency to local and general malignancy is but slight and in which treatment by operation affords satisfactory results even when the tumour has attained a very large size.

CHAPTER XVIII

ŒSOPHAGUS

Sarcoma of the œsophagus is a very rare disease, but carcinoma is not at all so uncommon. Probably at least 90 per cent. of all the cases of œsophageal carcinoma are cases of squamous-celled carcinoma (epithelioma), and this will not surprise any one who takes into account the nature of the mucous membrane of the gullet and its resemblance to the mucous membrane of the tongue. The disease may attack any part of the tube, from the termination of the pharynx down to the stomach, and while it is unusual in the central portion, occurs with almost equal frequency in the upper and lower halves. Ulceration takes place at an early period, and stricture is produced, for the growth quickly spreads round the circumference of the tube. Moreover, it extends in many instances quickly along the wall of the œsophagus in a vertical direction, both upwards and downwards, so that from one to two or several inches of the long axis may be affected; and, still further, it penetrates the thickness of the œsophageal wall, and early affects the surrounding structures, glueing them to the œsophagus, and often eating deeply into them. In this way the larynx and trachea, the bronchi and lungs, may be implicated, and masses of disease may be formed in the mediastinum. The lymphatic glands are affected in a very large number of instances, usually the glands which lie close to the œsophagus on a level with the epithelioma; but in some rarer cases glands situated at a distance of from two or four inches are cancerous. Secondary affection of other organs and tissues is not usual; but cases are recorded in which generalisation has taken place in the liver, the lungs, the bones, skin, &c.

The disease is essentially, for a considerable period at least, a local disease, resembling in this respect epithelioma of the lower lip and tongue, eating its way along, into, and through

the wall of the œsophagus, invading the structures immediately adjacent to the œsophagus, and affecting the neighbouring lymphatic glands.

It is not necessary separately to consider the other varieties of cancer which attack the œsophagus, for, with the exception that the scirrhous tumours usually run a slower course, and the soft carcinomas form larger growths, there is no essential difference between them from the point of view in which we are here interested—the possibility of radical surgical treatment.

Cancer of the œsophagus is a disease of adult age, becoming proportionally more frequent with advancing age, and very seldom attacking persons under thirty years old. It is much more frequent in males than females, resembling again in this respect cancer of the lip and tongue. It is invariably fatal, unless the patient is carried off by some intercurrent malady, and the fatal termination is seldom deferred for more than a year or a year and a half; while in many instances, perhaps the majority, death takes place within nine months of the first appearance of symptoms. The sufferers gradually waste and fade and die, sometimes suffering much pain in the later stages of the disease, but more often little pain, although there is great distress from hunger, dyspnœa, and other causes.

Methods of Operation.—In accordance with the rule I have prescribed to myself, I shall limit the question of treatment to operations intended to *cure* the disease. So far as I am aware, only one method of operative treatment has been employed to this end; that, namely, of excision of the cancerous portion of the gullet.

Excision of the Œsophagus (*Œsophagectomy*), first suggested by Billroth, who performed the operation experimentally on dogs, was attempted on two occasions, in 1875 and 1876, on the human subject by Kappeler, but was first carried out successfully by Czerny in 1877.

In the last twenty-two years the operation has gained scarcely any ground. De Quervain has collected all the cases in which malignant disease of the cervical portion of the œsophagus has been resected (*Archiv f. klin. Chir.* lviii. 858, 1899). Including his own case, in which the operation was performed at the beginning of the present year (1899), they are only fourteen in all, and there is doubt whether some of

them should not be omitted as rather falling under the head of pharyngeal carcinoma. I am only aware of one instance in which carcinoma of the middle portion of the œsophagus has been removed. The operation was performed from the back, portions of some of the ribs were resected, and the disease was removed from the posterior mediastinum. The patient died of the result of the operation, which is described by Professor Rehn (the operator) in the volume of the *Archiv für klinische Chirurgie* for 1898.

All the operations for cancer of the cervical portion of the œsophagus have been performed on much the same lines, so far as incision and the mere removal of the disease are concerned. The ordinary position and incision for œsophagotomy were selected; the omo-hyoid muscle was divided. The thyroid gland and vessels were drawn aside, and the œsophagus was so far exposed that induration could be distinguished in its wall. Czerny's operation was simple and easily performed. The affected portion of the œsophagus could be clearly separated from the surrounding parts above and below, and there did not appear to be any enlargement of the lymphatic glands. Six centimetres of the whole circumference were removed, and the stomach end was fastened to the wound in the skin, for it was found impossible to bring the cut ends together.

This patient had suffered from symptoms of obstruction to the passage of food for a period of five months. In spite of that, the conditions were very much more favourable to a radical operation than they are likely to be found, unless the disease is submitted to operation at a very much earlier period. A perusal of the other cases which have been collected by de Quervain shows that, in some of them, the air-passages were so involved that the larynx and upper part of the trachea was obliged to be resected. The recurrent laryngeal nerve was involved; the thyroid gland; and the primary disease was generally more extensive and adherent than in Czerny's case. These complications necessitated certain modifications of the simple operation performed by Czerny. To gain more space the sternal attachment of the sterno-mastoid muscle was divided. Preliminary tracheotomy, œsophagotomy, gastrostomy—one or other of them—were performed to provide for certain contingencies which might or did arise. De Quervain's own case is in point. The stricture commenced just below the

larynx, and, at the time of the operation, was found to extend down almost as far as the arch of the aorta. Gastrostomy was performed on the 9th of January, and on the 19th, when the patient was better nourished and the gastric opening was working well, the removal of the cancer was performed. The left recurrent nerve and the left lobe of the thyroid were involved in the mass, which was separated with difficulty from the trachea. The stomach end of the œsophagus was so deep down that it could not even be attached to the edges of the wound in the skin. It was left to take its chance at the bottom of the wound, even the orifice could not be closed. About nine centimetres of the œsophagus were removed. The upper end of the tube served to carry away the saliva and mucus from the mouth, and was converted into a salivary fistula, which had to be kept open by regular use of bougies. The patient, who was a man fifty years of age, made a good recovery; but, by the end of March, about two months after the operation, presented signs of recurrence in the trachea, which rendered the performance of tracheotomy necessary.

Results of Operations.—The results of the fourteen operations are very discouraging. Tabulated, they are thus presented:

Died of the operation	5
False passage of bougie seven weeks later . . .	1
Dead or alive with recurrence	6
Not yet reported	2
Total	14

Two of the patients who died of the operation died of suppurative inflammation of the posterior mediastinum and sepsis, and the same fate befell the man who made a false passage with his bougie seven weeks after the operation. One died within a few hours of paralysis of the heart: one of secondary hæmorrhage from the superior thyroid artery on the fourteenth day, and the last of septic pneumonia, which was present before the operation was performed.

In the group of cases of recurrence, the disease returned generally very quickly—within a few weeks—and the longest period which any of these patients was known to have lived was thirteen months.

The final result in two of the cases is not recorded. In one

of them, the operation was performed by Czerny in 1895; but the operation in the second case was only performed last year.

Even in the cases in which the patient remained well for several months—and they are only three or four in number—the condition was by no means satisfactory. The scar-tissue between the upper and lower ends of the œsophagus contracted and required to be kept open by the frequent passage of a bougie. In one patient, the passage of the bougie led, seven weeks after the operation, to the fatal result which has been already mentioned. In order to obviate this grave defect of the operation, very ingenious methods have been adopted. Mickulicz resected a cancer of the œsophagus in a woman, fifty years of age, and fastened the lower end of the cut tube to the edges of the wound in the skin. Four months later, there was considerable narrowing of the wound-channel. Examination discovered that the integument had been drawn in by the retracting œsophagus. Mickulicz took advantage of this discovery, separated the inverted portion of skin from the surface skin, and thus allowed it to adjust itself. This it did in such a manner as to occupy the space between the upper and lower ends of the resected œsophagus, and the natural channel was once more restored, with the exception that it was formed in part of mucous membrane and in part of skin. It appears to have acted well until the death of the patient, from recurrence of the disease, about eleven months after the first operation. The proof which was thus afforded of the possibility of replacing the resected portion of the œsophagus by means of the external integument has been used with great ingenuity by Dr. Narath of Utrecht (*Archiv f. klin. Chir.* lv. 831, 1897). In spite, however, of the care expended on the construction of the new gullet and the success of each operative measure in turn, the patient seems to have been forced to use a bougie.

Such is the condition of the operative surgery of malignant disease of the œsophagus up to the present time. Whether very much earlier operation will produce better results in the future, we have yet to see. At the end of several months from the first appearance of symptoms, the disease is generally so far advanced that almost the whole, if not the whole, circumference of the gullet is affected, and it is generally

necessary to remove at least several centimetres of it. After this has been done, it is rarely possible to bring the ends together. If the lower end can be attached to the integument, the patient may be able to live with tolerable comfort, feeding through the opening in the neck. But even then, stricture may result, and further operation may be required to relieve the stricture. If the lower end cannot be attached to the integument, stricture will inevitably result, and will require to be treated by dilatation or by plastic operation repeated, probably, more than once. Even then, it is not certain that stricture will be prevented. If the resection is carried as far down as in de Quervain's case, the condition of the patient is very pitiable. Condemned to feed for the remainder of life through an opening in the stomach, saddled with a salivary fistula in the neck or with the necessity to discharge fluid from the mouth at very frequent intervals during the day and night, it may be doubted whether life, under such conditions, is worth living.

It can scarcely therefore be a matter of surprise that the operation of œsophagectomy has not hitherto been practised by British or American surgeons.

CHAPTER XIX

LIVER AND GALL-BLADDER

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During the past ten years several important communications have been published, which deal with the removal of tumours from the liver and the results which have been gained; consequently, this subject has received an increased amount of attention from surgeons. The most important of these communications are (*a*) Terrier et Auvray, *Les Tumeurs du Foie: Revue de Chirurgie*, 1898; (*b*) Kousnetzoff et Pensky, *Sur les Resections partielles du Foie: Revue de Chirurgie*, 1896, and (*c*) Keen, *Removal of an Angioma of the Liver*, with a table of fifty-nine cases of operation for hepatic tumours: *Pennsylvania Medical Journal*, 1897. Langenbuch in his recently published treatise on the Surgery of the Liver and Gall-Bladder has also given a detailed and critical account of all the experimental researches which have been carried out in connection with the removal of portions of the liver. (Langenbuch, *Chirurgie der Leber und Gallenblase: Deutsche Chirurgie*, 1894–1897.)

Malignant growths primary in the liver are either carcinomata or sarcomata, the former being much more frequently met with.

Carcinomata of the liver, which are primary in origin, are met with in three main forms. The first form or variety commences in the hepatic epithelium of the glandular alveoli, in one or at most a few foci, and gives rise to the development of a mass of growth, which in the early stages is limited to one portion of the viscus. The right lobe of the liver is the part which is first involved in the majority of instances. Histologically the tumour has the structure of a cylindrical-

celled or a spheroidal-celled carcinoma. This variety of cancer of the liver is of most interest from a surgical point of view, since it is the form which is most amenable to direct surgical interference. The second form commences in the hepatic epithelium within the glandular alveoli, affects a considerable portion of the hepatic substance, is associated with the development of a considerable amount of fibrous tissue, and gives rise to a condition which somewhat resembles that seen in cases of alcoholic cirrhosis. This form of hepatic cancer has been called "malignant cirrhosis of the liver." The third form usually commences simultaneously at several spots or foci along the course of the intra-hepatic branches of the portal vein, and in the epithelium which forms the internal lining of the small intra-hepatic bile ducts.

Primary sarcomata of the liver are of very infrequent occurrence. They commence in the connective and fibrous tissues between the lobules of the organ and along the course of the portal canals. Both round-celled and spindle-celled forms of growth have been met. The new growth takes place mainly in close proximity to the blood vessels.

The anterior and inferior aspects of the right lobe are the portions of the liver where malignant growths usually have their seat. In the cirrhotic form both lobes are generally involved. When a primary growth of the liver has existed for some time, secondary deposits are usually to be found in other parts of the viscus.

The tumour is generally closely connected with the hepatic tissue, and there appears to be little tendency for it to assume either a pedunculated or encapsulated form. One or two cases of pedunculated adenomata have been described which appear in reality to have been true carcinomata.

When the malignant growth is situated in the more common situation, that is in the region of the antero-inferior border and is a carcinoma, the lymphatic glands in the portal fissure and between the two layers of the gastro-hepatic omentum are liable to become the seat of secondary growths.

From a study of the recorded cases, carcinoma of the liver appears to be slightly more common in males than in females. The recorded cases of sarcoma have been met with mainly in children or in young adults.

The duration of the disease is difficult to estimate owing to

the fact that it may have existed for a considerable period before giving rise to symptoms from the appearance of which the presence of the disease can be diagnosed. The recorded cases of sarcoma have generally only survived for a few months, but some cases of carcinoma have lived for many years, one ten years (Ludlam) and one twenty years (Groube).

Methods of Operation.—Operations which have for their object the removal of a malignant growth from the liver comprise excision of the tumour together with a portion of the adjacent liver tissue. Two distinct classes of operation are practised. In the first class the affected portion of the organ is exposed through an incision made in the overlying portion of the abdominal, or abdominal and thoracic, parietes, then brought out through the wound so made, and fixed to the margins of the parietal incision by the insertion of a ring of sutures, each suture of which passes through the liver substance well beyond the limits of the growth and also through the abdominal wall a short distance from the margin of the incision. When fixation has been effected in this manner, the base of the tumour may be encircled by an elastic ligature and the portion of the organ containing the tumour allowed to become gangrenous, and separate as a slough; or dressings may be applied, and three or four days later, when the liver and the margins of the parietal incision have become adherent, the diseased portion is removed either with a scalpel or with the knife of a thermo-cautery. Both varieties of this class of operation have been employed, and moderately good results, from an operative point of view, obtained.

In the second class of operations, the tumour and the adjacent portion of the liver are removed, and the operation completed at one sitting. The early stages of the operation are similar to those of the preceding until the affected portion of the organ has been brought out into the parietal wound. The circulation in the liver or the affected portion of it is next controlled either by the application of an elastic tourniquet to the base of the tumour, or better still by compression of the hepatic and portal vessels as they pass between the layers of the gastro-hepatic omentum. This can be effected either by digital pressure with one finger in the Foramen of Winslow and one in front of the gastro-hepatic omentum, or by the application of a "compressor" to the vessels. When the

circulation has been controlled by either of these methods, a wedge-shaped piece of the liver which comprises the tumour and the adjacent hepatic tissue is removed by cutting with a scalpel or the knife of a thermo-cautery. The divided blood vessels are then picked up with artery forceps—they can readily be recognised by their open mouths—and silk ligatures applied. Next, the margins and cut surfaces of the incision in the liver are brought together and fixed in close apposition by the insertion of silk sutures. These sutures must not be tied too tightly, otherwise they will cut through the liver tissue at each margin of the incision.

If there is much hæmorrhage from the wound in the liver after the pressure upon the vessels in the portal fissure has been removed, the region of the operation should be carefully packed with a long strip of gauze, one extremity of which is brought out through an angle of the parietal incision, which is left open for the purpose. The remaining portion of the abdominal wound is then closed.

Total extirpation of the liver has not been practised, since it is not possible for a person to live from whom the entire organ has been removed, even if this were possible from an operative point of view. (Cases of removal of carcinoma of the gall-bladder, in which the disease had extended to the liver and necessitated removal of a portion of this viscus, are considered in connection with malignant disease of the gall-bladder.)

Results of the Operation.—The results which have been obtained are not favourable. In many of the recorded cases the after history of the patient is not available.

I have been able to collect from surgical literature accounts of twenty-one cases of malignant disease of the liver which have been submitted to operation and the diseased portion of the organ removed. Fifteen of these patients suffered from carcinoma (including adenoma) and six from sarcoma.

Carcinoma.—Five patients died as the result of the operation or within a few days after its performance. Death appears to have been due either to hæmorrhage or to shock and exhaustion. Of those cases which recovered from the operation the after history of five is not available.

Two cases were known to suffer from a recurrence of the disease, in one seven months and in the other eleven months after recovery from the operation.

The three remaining patients were said to be well, and to show no signs of recurrence two, three, and seven years afterwards.

Sarcoma.—The six cases of sarcoma show no mortality from the operation. Four cases suffered from recurrence and terminated fatally: one after the expiration of a few weeks, two at the end of four months, and one after nine months. The fifth patient was known to be well and to show no recurrence two years later, whilst the after history of the sixth case is not available.

Conclusions.—Resection of a portion of the liver for malignant disease has been associated with a mortality of nearly thirty per cent. as the direct result of the operation. Cases of carcinoma are more fatal than those of sarcoma.

Recurrence of the disease has taken place in a large majority of cases.

The most suitable cases for operation, and which are likely to be followed by a good result, are those in which the growth is a localised carcinoma situated in the antero-inferior margin of the right lobe, and in which the disease has not extended through the capsule of the organ and implicated the overlying peritoneum.

Gall-Bladder

Removal of the gall-bladder was first proposed and practised in the year 1882 by Langenbuch. He, however, suggested the operation in connection with a non-malignant affection, and it was not until several years later (in 1887) that extirpation of the gall-bladder for carcinoma was practised. Since that date a number of surgeons have recorded single cases of removal of the gall-bladder for carcinomatous growths. No case of removal of the organ for a primary sarcoma appears to be mentioned in the records of surgery.

Many of the cases which have been operated upon are described, or referred to, in the literature mentioned in the preceding chapter. Other important communications on the subject are by Courvoisier, Czerny, Heddæus, Martig, from a surgical, and Kelynack, Siegert, Yamagiva, and Zenker from a pathological point of view.

Primary malignant growths of the gall-bladder are derived

either from the epithelial elements of the mucous lining or from the connective tissues in the outer layers of the wall of the viscus. In the former case they are carcinomata and in the latter sarcomata. Carcinomata are relatively much more commonly met with than sarcomata. In fact, sarcomata are exceedingly rare, and have only been described by a few observers. Personally, I have never seen a case.

The carcinomata are either columnar-celled growths, or much less frequently cubical-celled or even spheroidal-celled.

The growth may take the form either of a papillary or fungous tumour, which extends inwards and forms a prominence in the interior of the gall-bladder, or of a cancerous ulcer from the floor of which infiltration extends to the adjacent portions of the wall of the viscus and to the adjacent parts of the liver. The latter variety of growth is the more common.

Relation to Gall-stones.—In more than ninety per cent. of cases of carcinoma of the gall-bladder which have been investigated either post mortem or during a surgical operation, gall-stones have been found to be present, and in nearly all these cases the calculi have consisted either of cholesterin or bile pigments or a combination of the two. By most authorities gall-stones are looked upon as the causative agent in the production of carcinoma of the gall-bladder.

Sex.—Females are more prone to become the subjects of carcinoma of the gall-bladder than males. Siegert, who has collected all cases of carcinoma of the gall-bladder which have been recorded in medical literature up to 1891, finds that 101 cases have been published. Of these, fourteen were males and seventy-nine females, and the sex of eight was not mentioned. Eighty-seven of these had calculi within the carcinomatous gall-bladder, in seven they were absent, and in seven the presence or absence was not stated.

Statistics appear to show that more than ninety per cent. of cases of carcinoma of the gall-bladder are associated with the presence of gall-stones, and that between seventy per cent. and eighty per cent. of the patients are of the female sex.

Age.—The affection appears to be most commonly met with in patients between the age of forty-five and sixty-five, from fifty to sixty being the most common. Several cases have been recorded in which they have occurred in persons between the ages of twenty and thirty.

Duration.—The duration of the disease in those cases which have not been submitted to operation has varied within considerable limits, according to the accounts of different observers. Stiller from a study of five cases states that the disease usually lasts from five to six years, whilst Courvoisier and Musser say that it only lasts for a few months from the time it has been first diagnosed. From an investigation of twelve cases which have come under my personal observation at different times, it appears that the disease has a duration from a few months to nearly two years from the time when symptoms attributable to the disease first manifested themselves.

The duration of life of patients who have been submitted to operation for removal of the growth appears to be somewhat similar to the above, as in nearly all cases recurrence has taken place within a few months from the date of local removal of the disease. In one or two cases, however, a recurrence has not taken place whilst the patient has remained under observation.

Methods of Operation.—A carcinomatous growth of the gall-bladder may be limited to the walls of the viscus, or it may have extended to that portion of the liver which lies in its immediate proximity, and on this account the variety of operation which is advisable differs.

(a) *Removal of the gall-bladder on account of a carcinoma which is limited to the viscus itself, or at most has extended to the proximal portion of the cystic duct.*—The peritoneal cavity is opened through an incision in the right linea semilunaris, three to five inches in length, which commences at the costal margin. When the peritoneum has been opened, the gall-bladder is sought for and brought into the parietal wound, and the coils of intestine protected from injury or contamination with the contents of the gall-bladder by flat sponges or pads. If there are any adhesions between the gall-bladder and either a portion of the alimentary canal or omentum, these are carefully ligatured in two places and cut through. In deep-chested people difficulty may be experienced in bringing the gall-bladder into the parietal wound. In order to minimise or obviate this, an assistant should be directed to lift the liver forwards either by hooking it up in front or by applying pressure in the right lumbar region from behind forwards. The peritoneum on the inferior aspect of the liver on each side

of the fissure for the gall-bladder, and at the anterior-inferior margin near the fundus of the gall-bladder, is divided with a scalpel. The gall-bladder is stripped backwards from the under surface of the liver by blunt dissection until the proximal portion of the cystic duct is reached. This duct is then surrounded with two silk ligatures, about half an inch apart, which are tied. The duct is cut through between the two ligatures and the gall-bladder removed. The free end of the cystic duct should be cauterised, or its interior well scraped with a small Volkmann's spoon. If there is any hæmorrhage from the surface of the liver from which the gall-bladder has been separated, it is arrested either by ligature of the bleeding points or the application of a cautery. If the sulcus in which the gall-bladder lay is narrow, it may be possible to unite the cut margins of the peritoneum over it; but usually this is not the case, and then it is necessary to pack this area with a strip of gauze, one extremity of which is brought out through the abdominal wound. The liver is now allowed to drop back into the peritoneal cavity, the sponges and pads removed, and the parietal wound closed.

(b) *Removal of the gall-bladder on account of a carcinoma, which has extended to the adjacent portion of the liver.*—When the gall-bladder is the seat of a malignant growth, and this has extended to the adjacent portion of the liver, the affected portion of the liver, together with the attached gall-bladder, is removed by making a wedge-shaped incision such as has been described in connection with "removal of malignant growths of the liver."

Before removal of the gall-bladder on account of carcinoma, a careful examination of the surface of the liver, the lymphatic glands in the region of the portal fissure, the course of the common bile duct, and the lymphatic glands in the gastro-hepatic omentum should be made, in order to ascertain if any secondary growths are present or if the ducts are affected by a direct extension of the disease. Hans Kehr has recorded a case in which a biliary fistula developed a short time after removal of the gall-bladder for a carcinoma, and on performing a second operation the common bile duct was found to be involved in a carcinomatous lymphatic gland the size of a walnut. No radical measure was possible, and the patient died ten days later.

Mortality from the Operation.—I have been able to collect sixteen cases of removal of the gall-bladder for malignant disease. Twelve patients recovered from the operation, and four died from causes directly attributable to the operative procedure. In one case death was due to hæmorrhage from the hepatic tissue in the region of the operation, a second succumbed to septicæmia, the third died from shock and syncope, whilst the fourth died from inanition.

Results.—Of the sixteen cases of which I have been able to obtain records, four, we have already seen, died from causes due to the operation. In the remaining twelve a local recurrence of the malignant growth was known to have occurred in nine patients within a few months from the date of operation, in one case the after history was not known, in one case the patient was alive and well one year and a half later, and the remaining case is still alive and shows no signs of recurrence eight months after removal of the growth. Recurrence has generally taken place two or three months after removal of the tumour, and in the cases above referred to, in which recurrence took place, nearly all were dead at the end of four months.

Most of the cases, however, which have been submitted to operation have had an extension of the disease to the adjacent portion of the liver, and on this account it has been necessary to remove a portion of this viscus as well.

If a diagnosis of the affection can be made at an early stage, before the adjacent structures are involved, and before there are any secondary deposits in the lymphatic glands, it is probable that much better results will be obtained in the future than have been in the past.

Conclusions.—(*a*) In every case in which it is thought that a carcinoma of the gall-bladder exists—and this opinion is based upon a fair amount of clinical evidence—it is desirable that an exploratory abdominal section should be performed at an early date, so that, if the diagnosis prove correct, a radical operation can be at once carried out which shall have for its object the ablation of the disease.

(*b*) That this operation shall comprise removal of the entire gall-bladder, and if necessary the adjacent portion of the right lobe of the liver.

(*c*) Better results will be obtained when the carcinomatous

growth is limited to the walls of the gall-bladder than when it has extended to one or other of the neighbouring viscera.

(*d*) In those cases in which secondary growths have developed, or in which the primary affection has extended widely into the surrounding tissues, no surgical operation is advisable, as it will probably not prolong the life of the patient, and, owing to the severity of the procedure, it may be followed immediately by a fatal termination.

CHAPTER XX

STOMACH

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THE frequency with which the stomach is the seat of malignant disease is well known. Sarcomata of the stomach are very rare. Schlesinger (*Zeitsch. f. klin. Med.* vol. xxxii.) describes two cases and found seventeen other cases recorded. Tilgen (Virchow's *Archiv*, vol. cxxxiii. p. 183) gives the whole literature of the disease, and found one sarcoma in 3500 post-mortem examinations. In four cases in the Guy's Hospital Museum the growth shows as a flattened plaque with well-defined edges affecting the pyloric end of the stomach. The secondary deposits were mainly lymphatic and not very extensive. That they can be successfully removed Billroth's case (*Wiener Med. Woch.*, 1888, vol. xxviii. p. 105) and Hartley's (*Annals of Surgery*, 1896, vol. xxiii. p. 609) well illustrate. I do not know of any means of distinguishing sarcoma of the stomach from carcinoma during the life of the patient. Carcinoma is *the* malignant disease of the stomach, and columnar-celled carcinoma is by far the commonest variety. It is sometimes extremely difficult to diagnose the variety of epithelium from which the growth has arisen, especially: (*a*) when the quickly growing cells are much compressed and become spheroidal in shape, and it is only when the growing edge of the tumour and the secondary growths are carefully examined that the true columnar cells are seen; (*b*) when colloidal changes have so altered the appearance of the growth that it may even be mistaken for a sarcoma.

The only other variety found is squamous-celled carcinoma:

(*a*) When it spreads from the œsophagus to the stomach.

(*b*) When it arises from a metaplasia of the stomach epithelium.

The commonest form of change in carcinoma of the stomach is a colloidal one. In many specimens that I have examined, although to the naked eye there was no sign of colloid change, after the sections had been stained by Weigert's Fibrin Method I found small patches of growth undergoing this change. It is a remarkable fact that a large proportion of the cases that have been recorded of carcinoma of the stomach in people under twenty years of age have undergone this colloid change. Growths which undergo extensive colloid change are less apt to infect distant parts than other carcinomata, but often form very large masses on the surface of the peritoneum.

Carcinoma of the stomach appears to attack men rather more frequently than women, and is distinctly a disease of adult age, rarely occurring in persons of either sex under thirty years of age, but from thirty onwards becoming more frequent until sixty years are past, when the total number of cases begins to decline, but the proportionate number probably remains the same or even increases.

Position of the Growth.—From statistics of 1796 cases, compiled from various authors, the pylorus was affected in 1110 cases, lesser curvature in 197 cases, the cardiac orifice in 158 cases, and the rest of the stomach in 331 cases.

The Paths of Extension and Dissemination in Carcinomata of the Stomach.

I. *Growth in Continuity.*

(*a*) The commonest manner in which carcinoma extends is to completely surround the viscus it grows from; converting it either into a rigid tube with thick walls, or forming an annular induration, constricting the lumen of the canal.

(*b*) The growth may break through the peritoneum, and then be disseminated by contiguity.

(*c*) The growth may spread at its edges, and ulcerate in its central part, showing as an ulcer with raised nodular edges.

(*d*) The growth may form a single (or multiple) real swelling, projecting into the lumen of the viscus, with very little ulceration.

(*e*) There may be very little growth visible in the viscus itself, but it may ulcerate through into the peritoneal cavity, or the retro-peritoneal tissue, or may become adherent to and ulcerate into any other viscus, or the anterior abdominal wall.

(*f*) The growth may invade the entire stomach wall and cause contraction of the viscus, the "leather bottle stomach."

An analysis of a large number of post-mortem examinations shows that growth in continuity takes place most frequently into the lymphatics of the greater and lesser omenta at the greater and lesser curves of the stomach. The liver, pancreas, and transverse colon are also frequently directly invaded.

II. *Lymphatic extension.*

Carcinoma may extend and be disseminated by the lymphatic system, either:

(*a*) By growth in continuity into the lymphatic vessels and glands in the neighbourhood of the primary tumour.

(*b*) By affecting remote lymphatic glands.

The cœliac, omental, mesenteric, and lumbar glands are most frequently affected.

III. *Hæmic Infection.*

Goldmann's "Anat. Untersuchungen über die Verbreitungswege bösartiger Geschwülste" (*Beit. z. klin. Chir.* Bd. xviii., H. 3), a recent important contribution to our knowledge of this subject, explaining the extension of carcinoma through the veins and arteries.

(*a*) *Venous extension*, to the liver and lungs, through the portal vein. Also the local extension of the growth through the valveless venules.

(*b*) *Arterial extension*, showing that affection of distant organs and tissues is really due to arterial emboli, and making clear the apparent anomaly of infection against the lymph current.

IV. *Implantation Growth.*

The possibility of implantation has been proved experimentally by Bergmann in man, and by Hannau in animals.

These experimental conditions are almost exactly reproduced naturally in cases of general carcinomatous infection of the peritoneum, and also by cases where two growths are found close together in the mucous membrane.

This form of extension in all probability explains many of the cases of multiple carcinomata of the alimentary canal.

Effects of a Carcinomatous Growth on the Stomach.

I. *Anatomical.*

These vary according to its size, its position, and the mode in which it infiltrates the walls of the organ.

(*a*) *Growth causing obstruction of the pylorus.*—The result is dilatation and hypertrophy, but the extent to which dilatation and hypertrophy may individually occur varies. If the tumour is not adherent to the surrounding structures it may drag the stomach out of position, so that the lesser curve is nearly at the level of the umbilicus.

(*b*) *Growths in the mid-region of the stomach* may also cause dilatation, either from the effect on the nervous system, or from muscular weakness produced by the presence of an infiltrating new growth.

(*c*) *Growth at the cardiac orifice.*—The stomach is small and contracted.

(*d*) *Perforation.*—This, according to Brinton, occurs in about four per cent. of cases. It may result in a sub-phrenic abscess, gastro-colic fistula, or a gastro-cutaneous fistula.

II. *Physiological.*

Generally there is great deficiency in the motor power of the stomach and a deficiency of hydrochloric acid, leading to delay of food in the viscus and bacterial fermentation, so that lactic acid is produced.

This is most marked in stenosis of the pylorus with dilatation.

Boas rightly lays stress on these facts as helping in the diagnosis of doubtful cases, but too much importance should not be attached to them, as Strauss and others have shown that they are not always reliable.

Diagnosis.—The whole trend of the modern surgery of the stomach is towards an early exploratory operation in all doubtful cases. An exploratory operation under modern aseptic methods is practically without danger, either immediate or remote. An incision is made through the linea alba above the umbilicus large enough to admit a forefinger, and the stomach examined. If a mass of any kind is discovered, the incision is enlarged, and the lump fully examined, and dealt with by one of the methods described later. Even if a simple cicatricial contraction of the stomach, or adhesions, are found to be the cause of the doubtful symptoms, an operation alone will give the patient permanent relief.

In fact, it cannot be too strongly impressed on medical men that in all doubtful cases an early exploratory operation should be advised if any radical relief of the symptoms is to be attempted.

Hemmeter (*Diseases of the Stomach*, 1898) advises operation : (1) when there is dilatation of the stomach ; (2) when cachexia exists ; (3) in the absence of hydrochloric acid ; (4) when there is an excess of lactic acid ; and, (5) when the Oppler bacillus is present. Keen adds : (6) the age, which is usually past forty ; (7) when hæmatemesis is present, which is probably in forty per cent. of the cases ; (8) possibly the examination of the blood may aid us, as the number of red corpuscles and hæmoglobin are said to be diminished, and the increase in white corpuscles, which normally occurs after a full meal, is absent in gastric cancer. "Stenotic symptoms, accompanied with these signs, are indications for operation, even in the absence of a palpable tumour. If on these grounds an exploratory cœliotomy, which is not of itself a dangerous operation with modern surgical precautions, is done, I believe that we shall have a very much better result from pylorectomy than we have heretofore."

Choice of Operation.—The surgery of the stomach has advanced enormously in the course of the last few years, and

many operations which were thought to be unjustifiable in England a few years ago are now undertaken with a good chance of success. The question of the general condition of the patient must be carefully considered beforehand. It is obvious that if the patient's strength is not sufficient to stand an operation on vital parts lasting an hour or so, one of the less severe methods of relieving the symptoms must be chosen, even though the local conditions may be favourable—*e.g.*, a posterior gastro-enterostomy may be performed, and at a later date, if the patient gains strength, a pylorectomy with closure of the stomach and duodenum.

If the growth is found to involve the cardiac orifice of the stomach, radical treatment is impossible and gastrostomy is the only palliative method to be thought of.

If the growth involves the body of the stomach, gastrectomy may be performed, either partial or complete, or a gastro-enterostomy, according to the size of the growth, the number of adhesions, &c., presence or absence of secondary growth.

If the growth involves the pylorus the operation is determined by the extent of the growth, the presence or absence of adhesions and secondary deposits; either a pylorectomy, a gastro-enterostomy, or a combination of both methods.

Keen says, "With our present views as to the thoroughness with which extirpation, not only of the primary tumour, but of all infected glands in any part of the body should be done, to remove a pylorus and to leave a number of infected glands behind is unsurgical. The patient runs a high risk with no corresponding benefit." Mickulicz has pointed out that these glands are in four series. 1. Those of the lesser curvature, which cluster especially around the cardia and the œsophagus. 2. Those of the greater curvature, clustering especially around the pylorus. 3. Those between the stomach and the transverse colon. 4. Those near the pancreas. For all cases of extensive glandular involvement, or extensive adhesions, I should unhesitatingly select the operation of gastro-enterostomy. But the debate last year (April, 1898), in the German Surgical Society, shows clearly that the trend of surgical opinion is setting in favour of the more radical operation of pylorectomy.

Methods of Operation.—I shall describe the following operations for:

1. Gastrectomy, complete and partial.
2. Pylorectomy.
   (*a*) With direct suture of the divided ends.
   (*b*) Combined with posterior gastro-enterostomy.

Preparation for the Operation.—For several days before the operation, and a couple of hours preceding it, the stomach is thoroughly washed out with tepid water. A soft rubber stomach tube and funnel, used as a syphon, is the best apparatus. If there is much dilatation of the stomach it is better to wash out daily for a week previously. Great attention is paid to the food which the patient can best tolerate, so that he may be fed on that food for the last few days before, and as soon as possible after the operation. The bowels should be emptied, the rectum especially, in order that there may be no unnecessary difficulty with nutrient enemata. The skin of the abdomen for at least six inches around the seat of the incision should be thoroughly cleansed and a mild antiseptic dressing put on to keep it clean. Every possible precaution should be taken to minimise the shock of the operation beforehand. The operating-room should be well warmed, all draughts excluded. A large water-bed should be provided and filled with hot water for the patient to lie on during the operation. The upper extremities, chest, pelvis, and lower extremities are well covered with warm woollen clothing. An enema containing an ounce of brandy is given immediately before the operation. Hot normal saline solution and transfusing apparatus should be ready for use.

1. **Gastrectomy.**—An incision is made in the linea alba and the bleeding arrested before the peritoneum is opened. After the opening of the peritoneum, a thorough examination is made of the extent and nature of the disease, particularly with respect to its relations to surrounding structures; of all others the pancreas and transverse colon and the lymphatic glands around the greater and lesser curvatures and those near the pancreas. This must be done gently, as the stomach, weakened by an ulcerating new growth, has been ruptured during this examination.

The operator now decides which operation he will perform.

If complete gastrectomy is decided on, the incision is rapidly enlarged at both its ends until full access to the parts required for operation is obtained. The stomach is now separated from

the parts with which it is naturally and abnormally connected. An aneurysm needle threaded with thin silk is pushed through the lesser omentum and made to take up a suitable portion of it. The double ligatures are tied and the intermediate tissue divided. This process is repeated until the whole of the lesser omentum is divided; care must be taken not to injure the hepatic artery, portal vein, and bile duct at the right-hand margin of the lesser omentum. Also to secure the gastric artery running in the pancreatico-gastric fold of peritoneum to the œsophageal end of the stomach. A hand can now be passed behind the stomach and the gastro-colic and gastro-splenic omenta can be tied piece by piece between double ligatures and divided. The stomach, being now isolated, is brought out of the abdomen as far as possible and any lymphatic glands which may be infected are removed, especially those near the pancreas. The peritoneal cavity is carefully shut off by packing iodoform gauze, or soft sterile cloths wrung out of hot sterilised salt solution, behind the stomach. As far as possible the rest of the operation is made, by changing the packing when necessary, an extra-peritoneal one.

The duodenum is next clamped and taken charge of by one assistant, the stomach by another; it is then cut through with scissors three-quarters of an inch clear of the growth, and at each cut the bleeding vessels are secured. The cut end of the duodenum is disinfected and covered with iodoform gauze. The œsophagus is then cut across in the same manner and the stomach removed, the surgeon and his assistants taking the greatest care that none of the contents of either viscus should escape, or, if this should happen, that it should be wiped up at once.

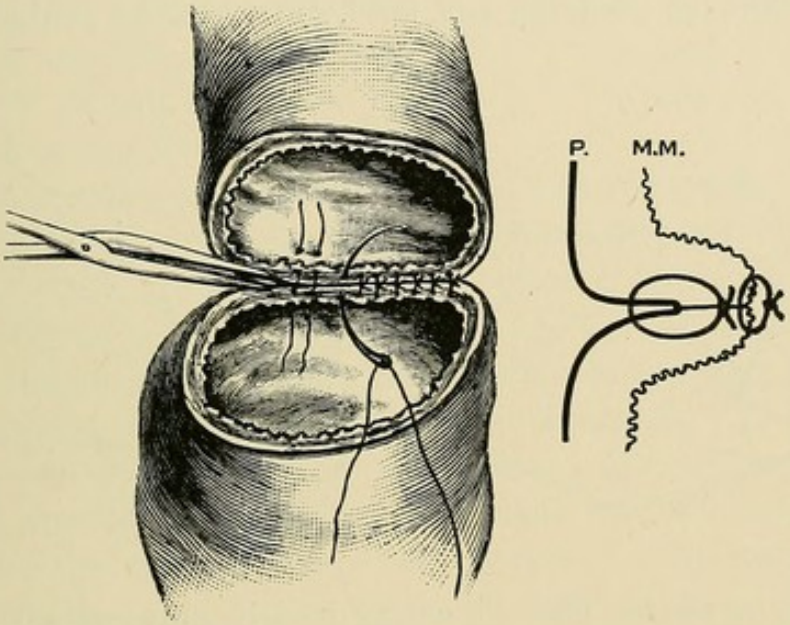
An attempt is now made to approximate the ends of the duodenum and œsophagus. If there is much tension the duodenum can be partly freed by dividing any retro-duodenal bands that seem to tie it back. The duodenum is then sewn to the œsophagus by two rows of sutures, one approximating the peritoneal and muscular coats, the other the mucous coats, of the two viscera (see Fig. 5). It may be impossible to bring the ends of the duodenum and œsophagus together; Schlatter overcame this difficulty in the first successful case of complete gastrectomy, by completely closing the end of the duodenum and implanting the end of the œsophagus into the

side of a loop of the jejunum, pulled up over the transverse colon, by means of Czerny-Lembert interrupted sutures.

If the patient seems collapsed after the disease has been removed, the length of the operation may be materially shortened by using Murphy's button to approximate the ends of the duodenum and œsophagus; this was successfully done in both Brigham's and Macdonald's cases. When the union is complete, the cut edges of the omenta may be united to the upper and lower surfaces of the newly formed parts.

The line of sutures in the viscera and the wound in the abdominal wall are now carefully disinfected, and the gauze or

FIG. 5



cloth packing removed. A drain of iodoform gauze may be left in if there is any doubt as to the perfect asepsis of the wound. The external wound is now closed in the usual manner and the dressing of the wound is such as the operator prefers.

The operation of partial gastrectomy is, in all its details, like the complete operation save that the bell-shaped cardiac portion of the stomach, after section, has to be narrowed by sutures before uniting it to the duodenum.

It need hardly be said that the operation of complete or very extensive gastrectomy is a very severe one, taking from one to three hours. The use of Murphy's button would seem to greatly shorten the time it takes.

Pylorectomy. — (*Billroth's Operation*). — The preliminary steps of Billroth's operation for pylorectomy are just the same as for gastrectomy, except that only so much of the omenta are tied off and cut through as will free the pylorus and the part of the stomach that is to be removed. When the stomach is freed, any cancerous glands or nodules are removed. The direction of the incisions for the removal of the cancerous parts varies somewhat according as it is intended to fasten the duodenum to the upper or lower curve of the stomach. In the former case, the direction is from above downwards, inclined from right to left. In the latter, from below upwards. The walls of the stomach are cut through with scissors, and at each cut the bleeding vessels are secured. If the stomach contains any fluid, this must be soaked up with

FIG. 6

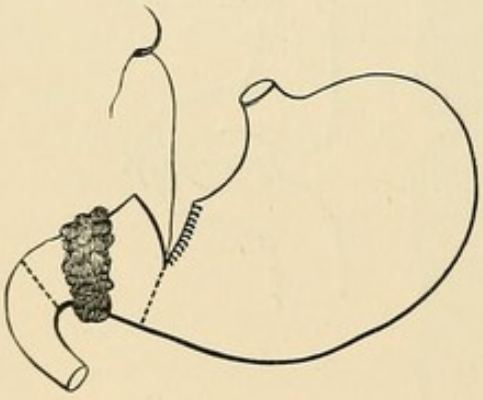
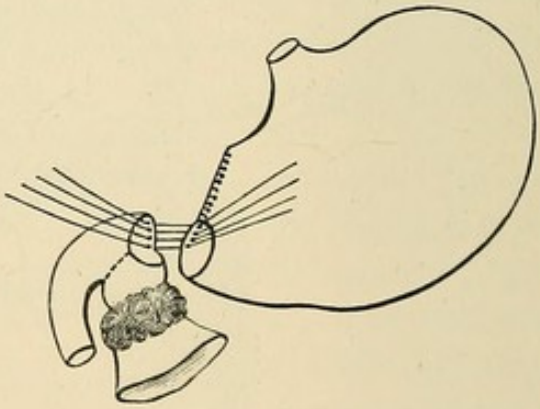


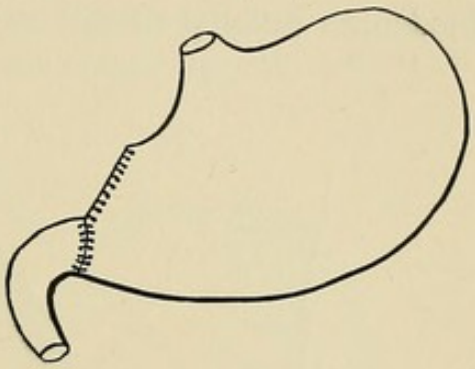
FIG. 7



sponges or swabs, and its cavity loosely plugged with strips of gauze, stuffed into a large sheet of gauze, for convenience of manipulation in suturing. This point is emphasised by Lauenstein (*Centralb. f. Chir.* No. 24, 1897). The vessels are ligatured with fine aseptic silk. The incision in the stomach should leave the pylorus still attached to the greater or lesser curve, and be long enough when it is sewn up to reduce the lumen of the stomach to about the size of the duodenum (see Fig. 6). The cut edges of the stomach are now united by a few sutures taking up the mucous coats and by a second series of Lembert's sutures exactly approximating the serous coats. The incision through the stomach is now completed, and half the duodenum is cut through (see Fig. 7). The duodenum is now loosely plugged in the same way as the stomach was. The divided part of the

duodenum and part of the reduced orifice of the stomach are now united by a double series of sutures, passed from the interior of the viscera (see Fig. 5). The gauze plugging should now be removed from both viscera. Lastly, the duodenum is completely divided, and sutured to the stomach so as to exactly approximate the two viscera (see Fig. 8). During the passage of the sutures and the application of the two portions of the alimentary canal to each other, the parts are held by the fingers of assistants, but clamps may be used on the part of the stomach and duodenum that is going to be removed. In sewing up the stomach, care should be taken to avoid the formation of any folds. An additional suture should be passed at the angle of junction formed by the end of the first incision in the stomach wall and the duodenum, as a leakage is likely to take place at this point. Fine aseptic silk and round half-curved needles should be used. The line of suturing should now be disinfected, and the cloths or gauze shutting off the peritoneal cavity removed. The omenta are attached to the margins of the newly formed parts. The edges of the opening in the abdominal wall are united, and the wound dressed as the operator prefers. If the operator has any doubt as to the security of the line of union between the two viscera, an omental graft may be secured over it by a few sutures. This was done by Dr. Adams in a successful case (*Brit. Med. Journ.* 1896, vol. i., p. 966); he only used a single continuous Lembert's suture. Until recent years, Billroth's was the only operation for pylorectomy practised by most of the continental surgeons. The great difficulty in bringing the unequal segments of the stomach and duodenum into accurate apposition has led some surgeons to adopt other methods.

FIG. 8

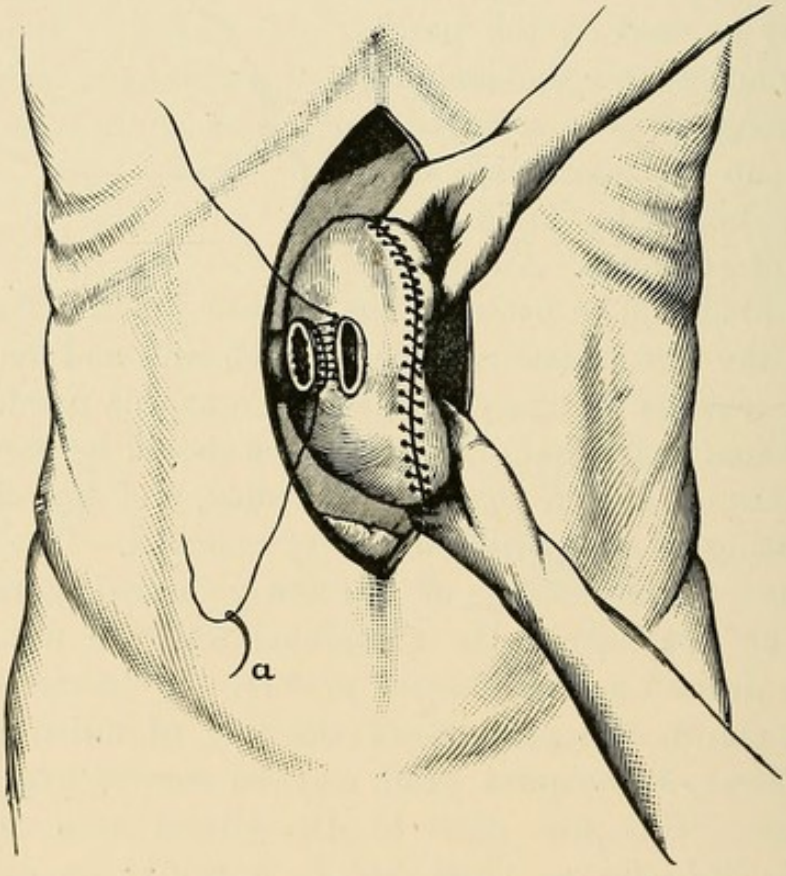


Combined Pylorectomy and Gastro-duodenostomy by Kocher's method of suture only.—The preliminary steps of the operation are the same as in Billroth's operation.

"After isolating the tumour, sterilised gauze is passed beneath it and around the duodenum and stomach, so as to prevent

their contents reaching the interior of the abdomen. A clamp is now placed upon the duodenum close to the edge of the tumour, and two (these being in line, one from above and the other from below) upon the stomach, well to the gastric side of the tumour. The clamps are large artery forceps, closed by the usual catch. They may be closed without hesitation, as there is no danger of causing necrosis of the gastric or intestinal walls. A second clamp is placed upon the healthy duodenum parallel to and beyond the first, and the intestine is

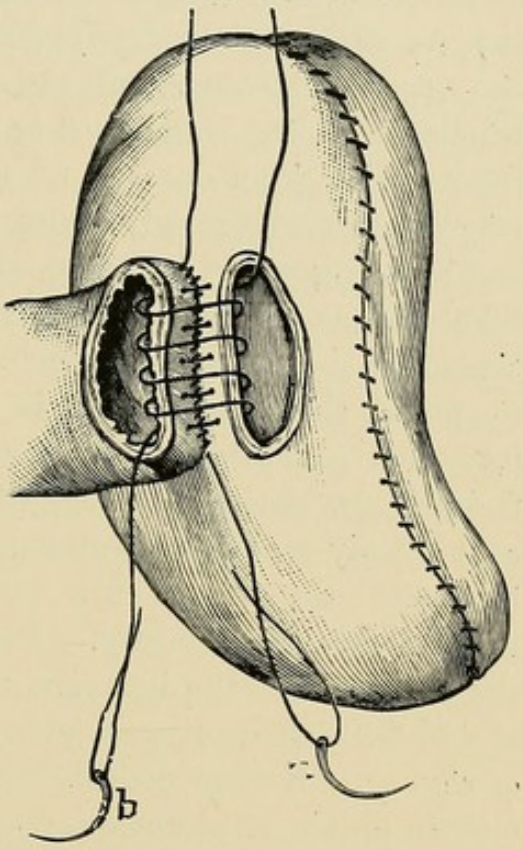
FIG. 9



then cut across between them. The edge of the gut which projects beyond the clamp is thoroughly disinfected by means of a small swab soaked in 1 in 1000 sublimate solution. The divided duodenum towards the side of the growth is merely wrapped round with sterilised gauze and lifted out with the growth; the other end of the duodenum is folded over the right margin of the wound and covered provisionally with moist gauze. The assistant now grasps the stomach from above and below between the forefinger and thumb, or between the index and middle fingers of each hand, in order to close it securely; and after placing a ring of gauze over the hands of

the assistant and round the stomach, the surgeon cuts across the latter well to the cardiac side of the two clamps. The new growth is laid aside, and after any escaped gastric contents have been swabbed up, and the more important bleeding vessels secured, the stomach is closed by a continuous silk suture, which penetrates *all three coats*. The projecting edges of the mucous membrane are thoroughly cleansed with sublimate solution. The continuous deep suture is then invaginated, and a continuous Lembert's suture carefully applied, so as to keep the serous coats reliably and completely approximated in their whole extent. Any gauze which is soiled having been changed, the assistant grasps the stomach so as to direct its posterior wall forward and to the right. The posterior wall of the duodenum (with the forceps still clamping it) is now applied to the posterior wall of the stomach in such a way that a *continuous posterior serous suture* (see Fig. 9, *a*) may be comfortably introduced between it and the stomach from the upper to the lower edge of the intestine. It is only now that the forceps are removed from the duodenum. The escaping contents are thoroughly removed and the lumen disinfected. Ligatures are applied to any bleeding points.

FIG. 10



The stomach is next incised vertically about $\frac{1}{4}$ inch from the posterior serous suture for a distance corresponding to the opening in the duodenum. *Another continuous posterior suture* (see Fig. 10, *b*) is next introduced, this one taking up all three coats. The ends of the posterior sutures, which have been left long, are now re-threaded and employed in succession for the *anterior sutures*, the order being reversed. The protecting gauze having been removed, the lines of suture are again thoroughly disinfected, the stomach and intestine replaced, and the wound closed."

"Kocher emphasises the following points as essential to success: (1) The operation must be performed *aseptically*, and the greatest care must be taken to avoid the entrance of disinfectants into the abdomen. Sublimate and its substitutes must only be used to disinfect the lines of suture and those areas of peritoneum which have been directly contaminated by the gastro-intestinal contents. Kocher thinks that collapse is often due to the too free use of such disinfectants. Even during a very prolonged operation, salt solution should be employed exclusively for the swabs and all the gauze placed around the wound. To prevent the entrance of gastro-intestinal contents, it is essential to use plenty of soft gauze. (2) As advocated by Rydygier and Lauenstein, *all the sutures*, the superficial, serous, and the deeper, which take up the whole thickness of the wall, *must be continuous* and without the least interruption from one end of the wound to the other; this is why Kocher so strongly urges leaving the ends of the posterior sutures long after knotting them, so that they may be again reliably knotted with the anterior sutures. A perfectly secure closure is thus obtained, and there is not the slightest necessity to prove that the suture is water-tight, by distending the intestine. Another reason for carrying the continuous suture through the entire thickness of both gastric and intestinal walls is that only by this means can reactionary hæmorrhage, which has been the cause of a certain number of fatal cases, be prevented with certainty. Fine strong silk must be used for the sutures, not the less reliable catgut. Kocher has not seen any of the disadvantages ascribed to silk. (3) *The employment of clamps.* Kocher considers these absolutely necessary for the closure of the cancerous portion, both on the duodenal and the gastric side. It is only in this way, as he has pointed out (*Centr. f. Chir.* 1883, No. 45), that the dangerous escape of cancer juice can be prevented with certainty. The clamps have the following additional advantages—viz., that the intestine, and more especially the stomach, can be cut across along an exact line at the place desired, a matter which is otherwise not always easy. Further, the use of clamps greatly shortens the operation. They produce complete closure, and serve as convenient handles for drawing up and manipulating the parts. They increase the possibility of completely disinfecting the cut edges immediately after the section by

preventing their slipping back. Lauenstein's objection that they necessitate removal of additional sound tissue is hardly a disadvantage, as the prospect of a permanent cure is thereby increased. As to other disadvantages Kocher is convinced that they cause no necrosis if the operation be properly and aseptically performed. He has no hesitation in applying a clamp to the healthy part of the duodenum where it is afterwards to be stitched. In his use of clamps Kocher applies no elastic covering after the manner of Gussenbauer, nor does he use the elastic bands of Rydygier. He merely clamps them firmly enough to thoroughly close the intestine and stomach, and has observed that the edges of both bleed actively as soon as the clamps are removed. Finally, Kocher denies that the clamps, by requiring unnecessary room, necessitate a needless separation of the mesentery as stated by Lauenstein."*

If the operator wishes to save time, on account of the condition of the patient, a Mayo-Robson's bobbin, or Murphy's button, could be used to unite the end of the duodenum to the posterior wall of the stomach, instead of sutures only. Or an operation could be performed in two stages as recommended by Quénu (*Rév. de Chir.* Oct. 1895). The gastro-jejunostomy performed first will improve the condition of the patient. Then a pylorectomy with closure of the stomach and duodenum. Czerny now does this at one operation, and has given up Billroth's operation.

The shock of the operation will be best overcome by intravenous injection of enough hot, sterile, normal salt solution, with a little brandy in it, to bring back the pulse to a fairly normal condition.

If this is not necessary at the time of the operation ten ounces of warm water and half an ounce of brandy may be given per rectum, and repeated every half hour if the shock continues.

After Treatment.—Two circumstances deserve to be kept particularly in mind: First, that the patients are generally much debilitated at the time of the operation; second, that they do not usually thrive when fed by the rectum. Still, if the patient's strength will admit of it, nothing should be given by the mouth for forty-eight hours in order to give complete rest to the wounded parts.

* "The Operations of Surgery," by Jacobson, page 923, 3rd Edition (J. & A. Churchill).

Nutrient enemata should be thoroughly peptonised, bland, concentrated, and warm. About four ounces at a time should be given, though many patients can retain half a pint. The rectum should be washed out once every twenty-four hours. After the first forty-eight hours, or directly vomiting from anæsthetic has stopped, if necessary, peptonised milk or meat essence with a little brandy added, should be given. Begin with small quantities, a drachm every hour at first, then increase the amount rapidly if it is well taken. After the first few days the food which the patient could best tolerate before the operation will be the safest to give. It should be well pounded and contain no hard or indigestible pieces.

Results of Operations.—*Mortality of Complete Gastrectomy.**—There have been seven published cases of complete gastrectomy with three deaths.

Conner (*Med. News*, November 2, 1884): The patient died on the table. *Summa* and *Bernays* (*Journ. of American Med. Assoc.* February 12, 1898): Patient died in thirty-six hours, collapsed. *Noble* (*New York Med. Journal*, July 23, 1898): Patient died on the table. Noble states that the patient was too far gone to hope for success, and that the operation was only undertaken at the urgent request of the patient.

Seven cases of very extensive and nearly complete gastrectomy have been published, with two deaths. *Langenbuch* (*Deutsche Med. Woch.* p. 968, 1894) reports one fatal case of removal of $\frac{7}{8}$ths of the stomach, the pylorus being anastomosed almost directly to the cardia.

Baldy (*Journal of American Med. Assoc.* March 5, 1898, p. 523) removed all the stomach, except a small piece at the cardiac end and united the two ends. The patient died after three hours.

Of these fourteen cases of complete, or nearly complete, removal of the stomach nine recovered and five died. All these five deaths were directly due to the shock of the operation. The fact that all the patients who rallied from the shock of the operation ultimately recovered seems to prove that the technique of uniting the duodenum to the œsophagus,

* I must state here how much I owe to two admirable series of lectures on the Surgery of the Stomach, the one by *Keen* (*New York Med. Journal*, May–June, 1898), the other by *Barker* in London, 1898 (*Clin. Journal*).

or cardiac end of the stomach, is simpler and more successful than that of Billroth's pylorectomy.

Partial Gastrectomies.—*Körte* (*Centralb. f. Chir.* 1898, No 10, p. 28) reports the case of a woman, age thirty-seven, who suffered from what was supposed to be an ulcer of the stomach. Finding the anterior wall thickened, he excised it, and the microscopical examination showed it to be an adeno-carcinoma. She recovered and gained twenty pounds in weight.

This would seem to show that a small localised growth in the stomach can be removed without much danger to the patient. But such cases seem to be extremely rare.

Pylorectomy.—The mortality of this operation when first performed by Péan in 1879 (*Gazette des Hopitaux*, 1879, No. 60), and Rydygier in 1880 (*Deutsche Zeit. f. Chir.* xiv. p. 252), and Billroth in 1881 (*Wien. Med. Woch.* 1881, p. 275), and later by many other surgeons, was enormous. Haberkant (*Arch. f. klin. Chir.* 1896, li. pp. 484 and 861) tabulates 257 pylorectomies with a mortality of 64.4 per cent. for the period of years between 1881–1887, and a mortality of 42.8 per cent. between 1887–1894. Goffe, in Barker's "Lectures on Surgical Affections of the Stomach," 1898, collected the English and American cases of Pylorectomy with a mortality of 76.5 per cent. from 1882 to 1890, and 28.6 per cent. from 1890 to 1898.

This shows that the death rate from this operation is constantly diminishing, due doubtless to the fact that surgeons now select only suitable cases for operation and that the physicians recognise cases at an earlier stage than previously, and the operation is performed before the patients become emaciated and debilitated. Partly also to the improved technique and skill of operators.

The results obtained by individual operators show even better results. Krönlein (*Wien. klin. Rundschau*, July 31, 1898) records all his pylorectomies, twenty-four in number. He lost three out of the first four cases and only two out of the last twenty.

Mickulicz (*Arch. f. klin. Chir.* 1896, li. p. 36) reports that in the last ten pylorectomies performed by himself he had only one death.

Kocher, by his method of combined pylorectomy and gastro-enterostomy, has had twenty-three cases with two deaths, and

Lücke of Strasbourg, by the same method, seven successful cases running. *Murphy* (*Lancet*, 1895, vol. i. p. 1041), by a similar method, but using his button, records four cases with one death.

In the debate of the German Surgical Society, April 1898 (report in *Philadelphia Med. Journ.* May 7, 1898), Hahn reported twenty-eight cases with ten deaths; Gussenbauer thirteen cases with four deaths; and Von Hacker nine cases with one death.

Cause of Death in Pylorectomy.—Haberkant (*loc. cit.*) gives the following results in ninety-one cases which were verified post mortem:—Peritonitis, forty-three cases; shock, thirty cases; asthenia, twelve cases; inter-current diseases, four cases; various, two cases.

Mickulicz (*loc. cit.*), in fourteen cases:—Collapse, four cases; perforative peritonitis, three cases; exhaustion, two cases; cause not mentioned, two cases; gangrene of colon, one case; pneumonia, two cases, in one of these there was an abscess in the lines of sutures.

In considering the causes of death the most potent cause, in the later cases at least, is the shock of the operation. Haberkant (*loc. cit.*) gives the following statistics as to results compared with the duration of the operation in eighty-nine cases:

HOURS.	CASES.	DIED.	RECOVERED.
1 to 2	37	14	23
2 to 4	45	23	22
4 to 5	4	3	1
5 to 6½	3		3
	89		

Although the three patients who were longest on the table recovered, the general teaching of the table is that long operations are followed by large mortality.

Undoubtedly speedy operating will diminish the death rate. The more quickly the operation is performed, provided the joint is secure and asepsis is perfect, the better the result will be. Kocher's results prove that it is safe to use continuous

sutures, if they are inserted according to his direction. This is a gain in speed.

Murphy's button and various decalcified bone bobbins have been used successfully to attain the same result. Well trained assistants are of the utmost importance. Any one who has seen one of the great continental surgeons operate, with two or three highly competent assistants, skilled surgeons themselves, who have helped the operator constantly with his work for years, will realise how much the perfect organisation of a great operation tends to its success. Peritonitis is still an important item in the mortality, although the death rate from this cause is growing less of recent years. Perfect accuracy of union, thorough exclusion of the rest of the abdominal cavity—*i.e.*, making the operation extra-peritoneal, and asepsis at each step of the operation, will avert deaths from peritonitis.

Gangrene of the colon is not likely to be an important item in the death rate in the future, as it is now recognised that such extensive or firm adhesions as would render necessary the removal of a piece of the meso-colon would contra-indicate the operation of pylorectomy.

Pneumonia and inter-current diseases will always be liable to occur, but much may be done by avoidance of unnecessary exposure and keeping the patient warm during the operation.

Contraction of the cicatrix occurred three months after a pylorectomy union by Lembert's sutures, necessitating the performance of a gastro-enterostomy from which the patient died (Mayo-Robson, *Roy. Med. Chir. Trans.* 1892, vol. 75, p. 408). This does not seem a common complication, though local recurrence of the disease has taken place in several cases. A very free removal of the growth would prevent this.

Two other circumstances are worthy of notice in relation to the mortality of the operation—first the age, secondly the sex of those who recovered. The patients who recovered were, for the most part, about forty years of age. But in three successful cases of complete gastrectomy, the ages were sixty-six, fifty-six, and fifty-three years, so that, if the case is a suitable one in other respects, age need not contra-indicate operative interference. The fact that women recover from abdominal operations of all kinds with greater certainty than men do holds good for pylorectomy. Haberkant (*loc. cit.*) found that of the 70 men operated on 25 recovered, and of the 140 women

66 recovered. That is, a mortality of 64.3 in men and 52.8 in women.

Cures due to the Operation.—The complete, or very extensive, gastrectomy cases are too few and too recent to say much about.

Porges (*Wien. Med. Woch.* Aug. 29, 1896), for very extensive carcinoma of the greater curvature, extending from the pylorus to within three fingers'-breadths of the cardiac end and encircling the stomach, excised the growth and united the duodenum to a strip of cardiac portion $1\frac{1}{4}$ inch wide. The cancer had not recurred after six years. This is a notably successful case.

M. Schlatter's celebrated case of complete gastrectomy (*Korrespond. f. Schw. Ärzte*, Dec. 1897). Portions of the œsophagus and the duodenum, as well as the entire stomach, were removed, the end of the duodenum was closed and the œsophagus implanted into the side of the jejunum by means of interrupted Czerny-Lembert sutures. Mouth feeding was begun on the second day and in four months the patient, a female, æt. fifty-six, had gained twenty pounds. Examination of the fæces showed that her powers of assimilation were perfect. She died one year and two months later from cancerous metastases, not insufficient nutrition (report of P. M. by Wendt, *Medical Record*, March 18, 1899).

Schuchardt in 1895 removed all of the stomach excepting three fingers'-breadths of the cardiac extremity. The remaining portion gradually dilated until at the patient's death, three years later, it held 500 c.c., and the patient, who at first only took small portions of food at a time, was finally able to eat an ordinary meal. Her final history is reported by Schuchardt (*Semaine Médicale*, April 20, 1898). She died of cancerous pleurisy. There was no recurrence in the stomach.

Brigham (*Boston Medical and Surgical Journal*, May 5, 1898) completely removed the stomach of a female, æt. sixty-six, and joined the duodenum and œsophagus with a Murphy's button. Hot water was given by the mouth on the second day, and by the thirteenth day she could swallow with ease. She left the hospital in seven weeks apparently quite well. The operation took two and a quarter hours.

Macdonald (*Journal of American Medical Association*, September 3, 1898) reports a similar case in a male æt. thirty-

eight. The union by Murphy's button was reinforced by five silk sutures. He was fed on the second day with half an ounce of peptonised milk and whisky every hour. He left the hospital apparently quite well. The operation lasted ninety minutes.

Richardson (*Boston Medical and Surgical Journal*, 1898) removed all the stomach, except a small piece of the cardiac end, in a female æt. fifty-three. The cardiac end was lessened by a few interrupted silk sutures. Tying and cutting some retro-duodenal bands freed the duodenum sufficiently to join it to the lessened cardiac end by interrupted Lembert's sutures. Water was given by the mouth on the second day. The patient went out apparently well. The operation lasted one hour.

It will be interesting to know what the ultimate result of these last three cases will be. Physiologically speaking, the stomach does not appear to be necessary to life; this fact at least has been added to our knowledge by these operations. Nevertheless, complete gastrectomy is hardly likely to become a regular operation in surgery. In the hands of surgeons of exceptional skill and experience it may be performed in rare and unusually favourable cases.

Pylorectomy.—Even up to 1896 a great improvement in the ultimate results of pylorectomy can be seen in Haberkant's (*loc. cit.*) tables.

Duration of life after Pylorectomy in fifty-one known cases.

Died within		Alive within	
1 year . .	17 patients	1 year . .	8 patients
2 „ . .	6 „	2 „ . .	4 „
3 „ . .	1 „	3 „ . .	5 „
4 „ . .	1 „	4 „ . .	2 „
6 „ . .	1 „	5 „ . .	1 „
		8 „ . .	1 „
Total	26	Total	21

The four other patients were alive, but suffering from recurrence.

Wölfler cites ten patients who were alive and well at periods of from four to eight years after operation. Seven patients were reported at the German Surgical Society to be living at various periods of from three to seven years after operation.

Probably these various records overlap, and contain some of the same cases. In spite of that, the results are decidedly encouraging.

The records of individual operators are not quite so good so far as cured cases are concerned. Krönlein and Mickulicz have each given a complete account of all the cases treated by them. In tabular form, they are as follows:

Died of the operation	6
Dead or alive with recurrence	16
Died of other cause than cancer within a year	2
Well less than one year after operation	7
Well from one to two years after operation	2
Well four years after operation	2
Total	35

The two patients who died of other causes, both died within two months of the operation of pneumonia and heart-failure.

On looking through the ultimate results of all these cases it is probable that about a dozen cases of undoubted gastric carcinomata have been cured by pylorectomy.

Most of the cases of pylorectomy that have been performed in the past—looked at from our present standpoint of knowledge and experience—would have been suitable cases for gastro-enterostomy, but not for pylorectomy. This is well shown in *Czerny's* last statement (*Berliner Klin. Woch.* 1897, No. 34). From 1881 to February 1893 he did nineteen pylorectomies and twenty gastro-enterostomies, but from 1893 to 1897 only ten pylorectomies and seventy gastro-enterostomies, owing largely to the fact that a radical extirpation was impossible of accomplishment.

Are patients who are not cured relieved by the operation?—This can fairly be answered in the affirmative as far as the operations of the last few years are concerned. Of the older operations recurrence *in situ* was frequent, and the period of relief was so short that it is very doubtful whether the operation was justifiable in most of the cases.

One may fairly compare the later results of resection of the stomach with gastro-enterostomy. The mortality of the latter operation is not very much lower than that of resection. No case of undoubted cancer has lived more than two years after gastro-enterostomy has been performed. In what proportion

of cases contraction of the opening into the stomach has followed gastro-enterostomy it is difficult to say accurately, but many cases are on record of this sequel. Also in many cases of gastro-enterostomy, especially by the anterior method first done by Wölfler in 1881 (*Centralbl. f. Chir.* 1881, No. 45), the relief given has been very slight, for a "vicious circle" has been established, that is, the contents of the duodenum have regurgitated into the stomach, and caused vomiting and much distress. Intestinal obstruction has also occurred as a sequela of gastro-enterostomy.

Conclusion.—The fact that must be obvious to all students of malignant disease of the stomach, as of any other part of the body, is the paramount importance of an early and thorough operation. The only possible means of discovering the presence of a malignant growth of the stomach at an early stage is by an exploratory operation directly sufficiently suspicious symptoms occur. If this is done, we can select a time when the patient is in good health and can do a thorough operation and remove all enlarged glands which would imperil the patient's future, instead of doing a makeshift gastro-enterostomy on a patient in wretched condition, as is only too frequently the case, even at the present time. In order to bring about this change the surgeon must have the hearty co-operation of the physician.

CHAPTER XXI

INTESTINE

By PERCY FURNIVALL, F.R.C.S.

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It is possible that any part of the intestine, from the pylorus down to the rectum, may be the seat of malignant disease, but there are certain regions which are peculiarly liable to it. The following table, compiled by Professor Ewald (*Twentieth Century Practice of Medicine*, vol. ix., 1897), from the statistics of Maydl, Bryant, Leichtenstein, Müller, and others, will illustrate this point.

Rectum . . .	874 cases	
Colon	148 „	of these twelve were in the transverse colon
Cæcum and appendix .	64 „	
Ileum . . .	26 „	
Duodenum . . .	19 „	
Jejunum . . .	17 „	
Total	1148	

The large number of cases in which the ileum is involved is probably due to the fact that carcinoma of the ileo-cæcal junction and valves are included.

Primary sarcomata of the intestine are rare, but they are distinguished from carcinomata by the fact that they occur sometimes in very young children, and, though they may cause stricture, as a rule cause dilatation of the bowel, probably by invading and paralysing the muscular coats, and this occurs especially in the small intestine. Madelung (*Centralbl. f. Chir.* 1892, s. 617) described fourteen cases of sarcoma of the small intestines in patients of various ages, mostly young—

youngest, four years, oldest, fifty-two. He states that these growths are "often multiple and sometimes congenital."

They are even rarer in the large intestine than in the small: most of the specimens I have seen in museums in England and on the Continent form nodular masses of growth. The metastases are generally extensive. Baltzen (*Archiv f. klin. Chir.* vol. xliv. p. 749) reports four cases in which sarcomata of the small intestine were removed, with two deaths and two recoveries. Hofmokl (*Annual of Univ. Med. Sciences*, 1889, vol. iii. p. 31) removed successfully the cæcum, appendix, and part of the ascending colon which were the seat of an "adeno-sarcoma."

I believe that the columnar-celled type is the only form of primary carcinoma found in the intestine, though the shape of the cells may be modified by various causes, as is the case in the stomach. That a columnar-celled carcinoma of the intestine may be easily mistaken for other forms of growth, even for sarcoma, is well illustrated by the fact that the late Professor Kanthack and I described a growth occurring in the colon of a boy aged seventeen at the Pathological Society (November 17, 1896) as a myxo-sarcoma, but on cutting more sections of the growing edge of the tumour we discovered that it was a columnar-celled carcinoma which had undergone colloidal changes, and reported the correction to the Pathological Society (May 4, 1897).

It is remarkable that a large proportion of the cases of intestinal carcinomata reported in young people have undergone colloidal changes. I have been somewhat surprised to find how frequently colloidal changes occur in intestinal carcinomata. On examining sections of a narrow scirrhus ring of growth which showed no sign of colloidal change to the naked eye, the microscope showed clearly that such a change had taken place.

According to Professor Ewald (*loc. cit.* p. 180), the influence of sex is nil in intestinal carcinoma, which commonly occurs between the ages of forty and sixty-five years; but Mayd! (*ibid.*) states that the cases which occur before thirty years of age amount to one-seventh of the whole number of intestinal carcinomata.

The disease may begin as a nodule, a plaque, a villous growth, or a ring, which surrounds more or less speedily the

circumference of the bowel, almost invariably producing stenosis.

The length of bowel affected is in many instances very short, and the amount of growth surprisingly small. In other cases a large mass of growth, involving a considerable length of intestine, is found.

The entire thickness of the wall of the bowel becomes gradually infiltrated, and the cancer may extend into the surrounding structures, causing the gut to adhere to them.

Secondary growths in the neighbouring lymphatic glands occur in less than half the total number of cases in which an autopsy has been made. More rarely nodules are found in the liver and other organs.

Haussman (*Thèse de Paris*, 1882) collected the results of 112 autopsies of cases of carcinoma of the large intestine.

In 21	cases	the	disease had become generalised.
„ 36	„	„	neighbouring lymphatic glands were involved.
„ 35	„	„	disease was limited to the gut (there was no special note as to the state of the retro-peritoneal glands).
„ 20	„	„	disease was absolutely limited to the gut without any doubt.
112	Total		

More than one growth is very rarely found, but undoubted cases of multiple growth do occur. In the museum of St. Bartholomew's Hospital, in one specimen (No. 2022) there are four separate growths, microscopically columnar-celled carcinomata, in the small intestines. In the Guy's Hospital Museum, in specimen 924, there are two growths, one at each end of the transverse colon.

Symonds (*Brit. Med. Journ.* 1893, vol. i. p. 638), records a case in which one growth was found in the ascending colon and another in the sigmoid flexure of the colon.

Weichselbaum (*Annual of Univ. Med. Sciences*, 1895, vol. i. p. 57) a case in which there was a growth in the cæcum, a second in the transverse colon, and a third in the rectum.

It is difficult to say in these cases whether the growths are of independent origin, or whether they are implantation growths, or due to arterial emboli of carcinomatous cells.

Effects of Carcinomatous Growths in the Intestines.—It has already been stated that the growth almost invariably leads, sooner or later, to a circular constriction of gut. The intestine above the stricture becomes dilated, and its walls hypertrophied. In chronic cases this dilatation and hypertrophy may be enormous and extend far up the bowel. Dr. Fagge (*Guy's Hospital Reports*, vol. xiv. p. 272) reports a case of carcinoma of the sigmoid colon where the splenic flexure was found to be as large as a distended stomach. The mucous membrane of the bowel above the stenosis is very often ulcerated; this is partly due to the distention affecting the vessels in the intestinal wall, and partly to the irritation of the retained fæces. Perforation caused by these ulcers is a common cause of death. According to Treves (*Intestinal Obstruction*), in the small intestine the ulceration is, as a rule, situated just above the growth, and is extensive. In the large intestine it is more limited, and is found just above the stricture and in the cæcum. The relative proportion of perforation in these two places is as 7 to 4. Occasionally the changes in the bowel above the constriction pass the limits of ulceration and the part becomes gangrenous; this only occurs in the large intestine.

The manner in which death occurs is sometimes by acute obstruction, sometimes by chronic obstruction, sometimes by perforation of the bowel and consequent collapse or peritonitis, sometimes by slow exhaustion.

Diagnosis.—Positive diagnosis at an early stage of the disease is impossible, and intestinal obstruction will almost invariably be the first symptom to attract the patient's attention. Crises of paroxysmal colic and periods of prolonged constipation and diarrhœa, with early weakness and progressive wasting, in spite of medical treatment. Unless a tumour can be felt there is nothing to distinguish a malignant from a simple stricture. If the disease is situated in the duodenum—Perry and Shaw (*Guy's Hospital Reports*, 1893, vol. l. p. 214) collected thirteen—it is usually mistaken for disease of the stomach. Riegel (*Med. Chronicle*, 1891, vol. xiii. p. 127) reported a case of carcinoma of the upper part of the jejunum where the pylorus was thought to be affected. In Morton's case (*Trans. Path. Soc. Lond.* 1893, vol. xliv. p. 89) the tumour was situated at the lower end of the ileum and could be felt as a well-defined

lump, the size of a walnut, in the left iliac fossa. If the disease is situated in the large intestine the vomiting is less marked, the abdomen more distended, and blood is often found in the motions. Injections of fluid into the rectum are not of much value in locating the growth, as the fluid often is able to pass through the stricture from below.

In any doubtful case, as in stomach growths, an early exploratory operation through the middle line of the abdominal wall is the surgeon's sheet-anchor. This is of the greatest value, for even the most experienced surgeons are liable to be misled by the deceptive ballooning of the gut which sometimes occurs below a growth, and there are a number of cases in which the colon has been opened below the growth.

Methods of Operation.—Before describing the various methods of resecting the intestine it will be well to lay stress on the great importance of relieving the distended bowel of its fæcal contents if obstruction is present. However skilfully the gut may be resected, if the obstruction is not relieved the patient will almost certainly die. Treves has recently stated that he has reduced his mortality 50 per cent. in acute intestinal obstruction by adopting this plan. Either Greig Smith's method of aspiration, or tying-in a Paul's tube, or a temporary fæcal fistula will relieve the obstruction and give the radical operation a far greater chance of success.

Preparation for Operation.—If there is no acute obstruction an attempt to unload the intestine may be made with small doses of calomel and enemata. The patient should be fed on the diet that suits him best, it should be nourishing, but should give little *débris*. Milk, broth, pounded meat, eggs, and peptones are indicated. All the methods of guarding against shock which have been described in the operations on the stomach (*q.v.* p. 241) should be adopted.

Operation.—The age, strength and state of nutrition of the patient, also the presence or absence of intestinal obstruction are carefully considered. If intestinal obstruction is present in at all an acute form, it is better to relieve it first and restore the tone of the intestine and the strength of the patient, and later proceed to a radical operation. If a definite tumour can be felt, it is better to cut down directly upon it, but if, as is often the case, the situation of the growth has not been located, an incision is made in the middle line at the level of the umbilicus

large enough to admit the operator's hand. The iliac fossæ are first explored, as the commonest seats of growths are the sigmoid flexure and the cæcal region. If no growth can be discovered here the state of distension of the gut is noticed, and the colon or small intestine are followed until the growth is located. Growths in the lower part of the sigmoid often lie in the pelvis.

When the seat of the disease is found the surgeon should quickly and carefully ascertain its size, definite outline, mobility, adhesions, and whether the neighbouring lymphatic glands, lumbar glands, or liver, are affected by secondary growth.

The surgeon now decides whether he can completely remove the growth or not. If adhesions, and extension of the growth into important structures or secondary growths will not allow of complete removal, a lateral anastomosis, short-circuiting the passage of the intestinal contents, is performed by one of the various methods in use, or an artificial anus is formed.

If, on the other hand, resection is decided on, unless the growth is in the small intestine, in all probability the median incision will not give free enough access to the parts to be removed. The median incision is rapidly closed either by the surgeon himself, or better by an assistant, and a free incision directly over the growth is made and the growth fully exposed. The rest of the peritoneal cavity is carefully shut off by sterilised cloth, iodoform gauze, or flat sponges. The diseased bowel is freed from its adhesions by gentle dissection, tying them and dividing between two ligatures, and is brought outside the abdomen. If a growth of the cæcum, ascending or descending colon is being dealt with, greater freedom will be obtained if the peritoneum on the outer side of the bowel be divided and the parietal peritoneum with its blood-vessels stripped off the posterior abdominal wall.

The gut above and below the growth is emptied of its contents by pressure with the fingers and two clamps are placed at least one and a half inches above and below the diseased mass. Mr. Makin's or Mr. Lane's clamps are convenient ones to use, but many other means of preventing the escape of any of the intestinal contents have been devised. The fingers of two trained assistants are preferable to any

mechanical device. Two more clamps or large pressure forceps are applied close to the growth above and below. The healthy bowel wall is now cut across at right angles to its long axis, above and below the growth and at least half an inch away from it. The cut ends of the bowel are covered with iodoform gauze. The incisions should now be continued inwards through the mesentry, or detached parietal peritoneum, in order to remove with the diseased mass a V-shaped portion, containing injected lymphatics. The vessels having been secured, the soiled cloths or sponges are replaced by fresh ones and any enlarged lymphatic glands are now removed.

The cut ends of the bowel are thoroughly disinfected with $\frac{1}{1000}$ perchloride of mercury solution, or other strong disinfectant. The surgeon then proceeds to unite the intestine by the method he has decided on, *i.e.*, suture, decalcified bone bobbin, or Murphy's button.

Treatment of the two ends of the Intestine.—Several factors must be taken into consideration in deciding this question. If the patient is standing the operation badly, or is suffering from the effects of intestinal obstruction, undoubtedly the safest plan to adopt is that recommended by Volkmann, Nélaton, Paul and others, namely, to secure both ends outside the abdomen, forming an artificial anus, and later on, when the patient's condition has improved, to re-establish the continuity of the alimentary canal.

If the two ends of the intestine differ very much in calibre, as is always the case in resection of the cæcum where the ileum must be joined to the ascending colon, it is probably safest to close both ends and establish a lateral anastomosis. Other methods have been suggested in order to enable an end to end union to be effected. Billroth lessened the calibre of the larger end by suture, as in his method of pylorectomy (see p. 244, Fig. 6); Madelung cuts the smaller end of gut obliquely and in this way makes it equal in size to the larger one. Other surgeons close the larger end and implant the smaller end into the side of the larger gut. Where the condition of the patient and the intestine will allow of it, immediate end to end union is the most satisfactory proceeding. This can be done in many ways, but the general trend of surgical opinion is undoubtedly in favour of effecting this by means of sutures. The sutures must be passed through healthy tissues and there

must be no tension on them. The suture in most common use is an interrupted one, of thin aseptic silk. One row of sutures joins the mucous coats, a second row joins the serous layers of the two ends of intestine (see p. 243, Fig. 5). This latter row is the most important. The sutures should be placed close together, eight or ten to the inch, and should include the muscular as well as the serous coat. The mesenteric attachment is the part that most attention should be paid to, as it is here the union is most likely to be defective. The narrowing of the bowel produced by this turning in of the bowel wall and the subsequent inflammatory swelling, is not of so much importance in the large intestine as it is in the small gut. Kocher's method of suture is likely to come into more general use, as it is more rapidly inserted, a gas-tight union is more easily secured, and the hæmorrhage from the cut ends of the bowel is controlled by it with certainty. In Kocher's hands and in those of many other surgeons it has given excellent practical results, and finally disposes of the question of the safety of applying continuous sutures to the walls of the alimentary tract.

It is inserted in the following manner. Beginning with the posterior half of the bowel, a long length of fine aseptic silk, threaded to a round straight needle, is passed through all the walls of the gut, taking up as much of the serous coat and as little of the mucous coat as is possible. This is tied and the piece of silk at the end of the knot left long. A continuous furrier's stitch is passed in this manner, uniting the two ends of the bowel along the posterior half of their walls. A continuous Lembert's serous suture is now started at the same spot and the end left long. This unites the two serous coats, burying the first suture, which is necessarily septic. When this serous suture has united the posterior half of the bowel walls, the anterior half of the deep suture is completed and the end is knotted to the end which was left long beyond the first knot for that purpose. It is then well washed with hot sterile normal salt solution, the anterior half of the Lembert's serous suture is completed and the ends are knotted together in the same fashion. A few points of Lembert's suture are now inserted over the knots at the mesenteric margin as an additional precaution. Finally the cut edges of the mesentery are brought together with a continuous suture. The whole is

washed again with hot sterile normal salt solution and replaced within the abdomen.

Bloch brings out the diseased loop of gut and fixes it outside the abdomen. At a second operation resects the growth and performs a circular enterorrhaphy. At a third operation, the continuity of the bowel being assumed, the adhesions are separated and the bowel replaced within the abdomen.

In the lower portions of the sigmoid flexure of the colon union of the two ends of the intestine, after resection of the growth, may be impossible. The proceeding that has been successfully carried out by several surgeons will be described under diseases of the rectum (see p. 287 "Abdomino-perineal excision of recto-sigmoid growths").

Murphy's button has been used, with varying success, as a means of uniting the two ends of the intestine. Czerny used it for the colon, but has given it up now, as he found that the lumen got blocked either by scybalous masses or semi-condensed faeces, and patients died of obstruction (reported by Jordan of Heidelberg, at the French Surgical Congress in 1898). If it is used, care must be taken that the size of the button is proportionate to the size of the gut, or ulceration of the mucous membrane will result; that the patient's diet and bowels have been carefully regulated for a week beforehand, or obstruction to the lumen of the button may occur (Waring, *Edinburgh Med. Journal*, September, 1897, "Lumen blocked with orange pips, after resection of the transverse colon for carcinoma.") A strong tie-string must be used and put in close to the cut edges of the gut; the ends of the tie-string must be cut quite short. The button must be pushed well in towards the mesenteric attachment. The cut edges of the mesentery must be brought exactly into opposition with one another.

Mayo Robson's decalcified bone bobbin, and many other forms of bobbin, have been successfully used, but they have no special merit when compared with union by sutures. An admirable monograph on the history, various methods of uniting the ends of the intestine, experiments, &c., by *Frey*, "*Über die Technik der Darmnaht*" (*Beiträge z. klin. Chir.* vol. 14, 1895, p. 1), may be consulted by surgeons wishing for further information on this subject.

Some experiments of practical value have lately been per-

formed by Chlumskij (*Centralbl. f. Chir.* 1899, ii., p. 33–37), as to the strength of the joint formed between two pieces of intestine by the various methods of union in common use. Water pressure was used as the test on living dogs, and the power of resistance, high immediately after union, diminishes continuously for the first four days after the operation, and then increases until, on the tenth day, the joint is stronger than the normal bowel. It becomes equal to that of the normal bowel in thirty days. The results did not differ greatly with the various sutures and buttons in common use. But decalcified bone bobbins and Murphy's buttons did not give quite so strong a joint as circular suture. The latter was also found to be stronger than a lateral anastomosis with sutures. Continuous sutures gave way at the knot. The net result of Chlumskij's experiments confirm the general trend of surgical opinion, *i.e.*, that end to end union by sutures is the best method at present devised. They also show that the third to the fifth day is a very dangerous period, owing to the parts becoming infiltrated and soft and so offering a less secure hold for the fixing materials.

The treatment of the two ends of the intestine having been decided on and carried out, the abdomen is closed and dressed in the manner which the surgeon usually adopts. If there is any doubt as to the asepsis of the wound it is safe to put a gauge drain or two into the doubtful recess.

After Treatment.—The effects of the shock of the operation must be treated first of all. The patient is placed in warm blankets with hot water bottles around him. His head is left low. An enema of ten ounces of warm water with half an ounce of brandy may be given, and repeated every hour if necessary. An intra-venous transfusion of a quart of hot sterile normal saline solution may be necessary, but generally enemata suffice. As little opium as possible should be given, as fatal intestinal paralysis may result. Nutrient enemata may be given, but generally feeding by the mouth will have to be commenced early. Directly the vomiting from the anæsthetic has stopped, as in the case of pylorectomy (see p. 250), liquid peptonised nourishment may be given in small quantities at frequent intervals. Flatus will probably be passed in forty-eight hours or earlier, and the bowels will act between the fourth and sixth days.

Results of Operations.—*Mortality due to the operation.*—I do not propose to say much about malignant disease of the small intestine, as it is somewhat of a surgical rarity. If a malignant tumour is found obstructing the duodenum, resection is practically impossible, but the symptoms may be relieved by a gastro-enterostomy. That malignant growths of the small intestine can be successfully removed is proved by Baltzen (*Archiv f. Clin. Chir.* 1892, vol. xliv. p. 749), who collected four cases where sarcomatous growths were resected. Two patients recovered, and two died of shock within twenty-four hours of the operation. A mortality of fifty per cent., but of course the number of cases is too small to be of much value.

Lardennois ("*Traitement Chirurgical du Cancer du Gros Intestin*," *Thèse de Paris*, 1899) has collected 241 cases of resection of the cæcum and colon, and many of the facts that follow are taken from his excellent *Thèse*.

Czerny's mortality for resection of the large intestine for cancer is fifty per cent. (Schiller, *Beiträge z. klin. Chir.* 1896, vol. xvii. p. 603) and (Czerny and Rindfleisch, *ibid.* 1892, vol. ix. p. 740).

Wölfler (XXV. German Surgical Congress, 1896) cited 114 cases of cancer of the large intestine, with a mortality of fifty-four per cent.

Von Bramann (XXVII. German Surgical Congress, 1897) resected the large intestine fourteen times for carcinoma, with six deaths—a mortality of 42·8.

Gussenbauer resected the cæcum four times for carcinoma, with one death—a mortality of twenty-five per cent.; and the colon nine times, with four deaths—a mortality of 44·4 per cent.

Franks (*Trans. Royal Med. Chir. Soc. Lond.* 1889, vol. lxxii. p. 211) collected fifty-one cases, with two of his own, performed between the years of 1843 and 1888; twenty patients died, giving a mortality of 40·8 per cent.

Macewen (*Brit. Med. Journ.* 1895, vol. ii. p. 966) resected the cæcum five times, with one death—a mortality of twenty per cent.

Wallace (*St. Thomas's Hosp. Reports*, 1897, vol. xxvi. p. 139) gives the results of twelve cases of resection of the large intestine for cancer, performed at St. Thomas's Hospital

between 1888 and 1897; seven died—a mortality of 58·3 per cent.

Lardennois (*loc. cit.*) collected 241 cases of resection of the large intestine for malignant disease, with eighty-four deaths, a mortality of 34·8 per cent.

Lardennois (*loc. cit.*) gave the sex in 114 cases: forty-four females and seventy males. Of these thirty-one females recovered and thirteen died, a mortality of 29·5 per cent. Of the males thirty-four recovered and thirty-five died (the result is not given in one case), a mortality of 50·7 per cent. This result confirms the belief that females recover more certainly after extensive abdominal operations than males do.

He also gives the method of uniting the two ends of the intestine after resection in 177 cases.

Methods of Uniting the Two Ends of the Intestine:

	Cases	Deaths	Recoveries	Mortality
Suture, circular, end to end	125	49	76	39·2 %
Maunsell's method .	4	0	4	0 %
Lateral anastomosis .	8	1	7	12·5 %
Artificial anus with secondary resection . .	16	4	12	25 %
Murphy's button .	16	7	9	43·9 %
Senn's plates . .	3	1	2	33·3 %
Mayo-Robson's Bobbin	1	0	1	0 %
Paul's method of invagination	2	2	0	100 %
Potatoe bobbin . .	1	0	1	0 %
Chapel's button . .	1	1	0	100 %
Totals	177	65	112	36·7 %

These are the results given by massing all the resections together.

The results of resection of various parts of the large intestine for carcinoma are as follows:

Cæcum and Ascending Colon:

95 cases, 29 deaths, 66 recoveries; 21 females (16 recovered, 5 died); 47 males (25 recovered, 21 died); in 1 result not given; sex given in 68 cases.

METHODS in seventy-nine cases (not given in fourteen cases):

	Cases	Deaths	Recoveries
Suture, circular, end to end	51	21	30
Suture, lateral anastomosis	5	1	4
Suture, Maunsell's method	1	0	1
Artificial anus with secondary resection	9	2	7
Closure of anus with enterotome	1	0	1
Murphy's button	7	2	5
Senn's plates	3	1	2
Mayo-Robson's bobbin	1	0	1
Paul's method of invagination	1	1	0
Totals	79	28	51

Total mortality, 35·4 per cent.

Transverse Colon and the Hepatic and Splenic Flexures:

82 cases, 29 deaths, 53 recoveries; 10 females (9 recovered, 1 died); 6 males (2 recovered, 4 died); sex only given in 16 cases.

METHODS mentioned in sixty-six cases; not given in sixteen cases:

	Cases	Deaths	Recoveries
Suture, circular, end to end	53	22	31
Suture, lateral anastomosis	2	0	2
Suture, Maunsell's method	1	0	1
Artificial anus with secondary resection	4	1	3
Murphy's button	6	2	4
Totals	66	25	41

Total mortality, 37·8 per cent.

Sigmoid Colon:

64 cases, 26 deaths, 38 recoveries; 13 females (6 recovered, 7 died); 17 males (7 recovered, 10 died); sex given in 30 cases.

METHOD given in thirty-six cases:

	Cases	Deaths	Recoveries
Suture, circular, end to end	21	6	15
Suture, lateral anastomosis	1	0	1
Suture, Maunsell's method	2	0	2
Artificial anus with secondary resection	3	1	2
Artificial anus alone	1	0	1
Murphy's button	3	3	0
Method of Block	2	0	2
Paul's method of invagination	1	1	0
Using a potatoe button	1	0	1
Chaput's button	1	1	0
Totals	36	12	24

Total mortality, 33·3 per cent.

Lardennois (*loc. cit.*) gives the cause of death in thirty-seven cases: peritonitis, fifteen cases; shock, eleven cases; collapse, five cases; intestinal obstruction, three cases; sloughing of the intestine, one case; embolism, one case; hæmorrhagic pleurisy, one case.

Czerny's nine deaths (*loc. cit.*) were due to peritonitis in eight cases and shock in one case.

The most important causes of death in resection of the intestine, as in resections of other parts of the alimentary canal, are shock and sepsis. Doubtless, many of the earlier failures were due to the faulty technique of the operation, and the fact that unsuitable cases were operated on. Obstruction was not relieved before the resection was performed. Very extensive growths, which, nowadays, would be treated by entero-anastomosis, were removed. The operations on these extensive cases lasted many hours, and the patients only a few hours longer. Operating early in the course of the disease, and relieving obstruction if it is present, before proceeding to resection, the greatest care being taken to combat shock and ensure asepsis and a perfect joint between the two ends of the intestine, ought to still further lower the death-rate. In cases that will not admit of complete removal, entero-anastomosis will give the greatest amount of comfort to the patient. This operation is of comparatively recent date. Lardennois has collected twenty-eight cases, with two deaths, giving a mortality of 7·6 per cent. If the obstruction is very acute an artificial anus must be formed, and the question of removal of the growth considered later on.

Cures effected by Resection.—The older statistics are not very encouraging. In *Frank's* table of fifty-one cases between 1843 and 1888 the results were as follows:

Died of the operation	20
Result not known	2
Died of recurrence	10
Lost sight of	9
Alive less than three years	9
Alive more than three years	1
Total	51

The following tables will show how much these results have been improved on during the last few years.

Von Bramann's fourteen cases (*loc. cit.*) resulted as follows :

Died of the operation	6
Died of recurrence	1
Alive less than three years	3
Alive more than three years	4
Total	14

Macewen (*loc. cit.*), in the discussion at the surgical section of the annual meeting of the British Medical Association, stated that he had resected the cæcum five times with the following results :

Died of the operation	1
Alive less than three years	2
Alive more than three years	2
Total	5

Wölfler (*loc. cit.*) cited the following cases :

1 case by Gussenbauer	alive after	16	years
1 case by Mickulicz	„ „	$8\frac{1}{2}$	„
2 cases by Czerny and Billroth	„ „	6	„
7 cases	„ „	4	„
15 cases	„ „	$1\frac{1}{4}$ to 4	„

Ruepp (*Lardennois loc. cit.*) cites a case of *Zehnder* alive after ten and a half years.

Wallace (*loc. cit.*), St. Thomas's Hospital results are :

Died of the operation	7
Died within a few months of the operation	2
Died from a second resection, for recurrence one year after the original operation	1
Alive less than three years	2
Total	12

Czerny (*loc. cit.*) :

Died of the operation	9
Died of recurrence	3
Alive less than three years	3
Alive more than three years	3
Total	18

One of Czerny's patients is living five and a half years, and another ten and a half years, after the original operation.

White (*Quarterly Med. Journ.* July 1899, p. 318) records a case of cylindrical-celled carcinoma of the lower end of the ascending colon, in which the colon and ileum were joined together by a Murphy's button, after resection of the growth, in a woman *æt.* forty-one years, who was quite well, with normally acting bowels, three and a half years after the operation.

Edmunds (*Trans. Clin. Soc. Lond.* 1897, vol. xxx. p. 111) records two cases. The first, with a cæcal growth which was resected, and an artificial anus formed, lived five years and ten months, and died of alcoholism. At the *post-mortem* examination no recurrence of the growth was found. The second case, with a sigmoid growth, died three years and three months later of a pulmonary affection, probably a recurrence of the growth in the lungs.

These statistics are distinctly encouraging.

Are patients who are not cured relieved by the operation?—In cases where the growth has been freely removed, and recurrence does not take place in the bowel, the above question can be answered in the affirmative. If recurrence takes place in the bowel, partial or complete obstruction will again occur, necessitating a second operation for the formation of an artificial anus, or an entero-anastomosis. Contraction of the bowel at the point of union of the two ends seems to be a rare occurrence in the large intestine. In a few cases a fæcal fistula has formed at the intestinal joint formed by the surgeon, but in most of the cases this has closed spontaneously.

Conclusions.—The statistics that I have given warrant the surgeon in strongly urging an early exploratory operation in all cases where the symptoms point to the presence of an intestinal cancer.

If the growth is limited to the bowel wall and the mesenteric or nearest retro-peritoneal lymphatic glands, it should be removed, wherever it is situated, if the general condition of the patient will allow it.

If the patient is suffering from the effects of intestinal obstruction this should be relieved before resection is attempted.

If the two ends of the intestine are very unequal in calibre

it is safest to close both ends and make a lateral anastomosis.

Sutures are probably the best means of joining the two ends of the intestine together, special care being taken about the mesenteric attachment.

Where the growth will not admit of removal, entero-anastomosis is the best way of temporarily relieving the sufferings of the patient.

CHAPTER XXII

RECTUM

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The rectum is a frequent seat of malignant disease. *Leichtenstern* (Ziemssen's *Cyclopedia of Medicine*, vol. vii. p. 635) found that at Vienna, out of 4567 cases of cancer, 143 were rectal and thirty-five of the other parts of the intestines, so that three per cent. of the whole and eighty per cent. of intestinal cancers were of the rectum. *Williams* (*Lancet*, May 24, 1884) found about the same percentage in the statistics of the London Hospital.

Sarcoma of the rectum is a very rare disease. *Ball* (*Diseases of the Rectum and Anus*, 2nd edit. p. 341) describes two cases, in one of which a lobulated mass, five inches by four, protruded from the anus, and secondary growths occurred on the skin of the thigh and scrotum; in the other, the rectum was converted for five inches into a narrow tube with walls an inch thick. Both were spindle-celled sarcomata. Ball also mentions a case of Billroth's in which a small-celled alveolar-sarcoma was successfully removed.

Melanotic sarcomata also rarely occur, and according to Virchow the rectum is the only part of the alimentary canal in which primary melanotic sarcomata are found. *Nepveu* (*Bulletins et Mémoires de la Soc. de Chi. de Paris*, 1880, p. 82) collected ten cases. *Ball* (*loc. cit.*) also successfully removed a melanotic sarcoma from the rectum, and the patient was free from recurrence nine years later.

Cripps, Treves, and others have found that the carcinomata of the rectum are almost invariably of the columnar-celled type. These growths are apparently not so liable to undergo

a colloidal change as they are in other parts of the intestine, but I have often found that, microscopically, this change has occurred, although its existence had not been suspected from naked-eye examination.

Squamous-celled carcinomata only occur when the disease has originated at the margin of the anus and extended to the rectum. This occurs in about sixteen per cent. of the total number of cases (*Duplay* and *Reclus*, *Traité de Chirurgie*, ed. 1898, vol. vi.).

Situation of rectal carcinomata.—*Duplay* and *Reclus* (*loc. cit.*) give a very practical classification of rectal growths, *i.e.* (1) those situated at the anus, (2) at the ampulla, *i.e.*, seven or eight cm. from the anus, (3) above the ampulla, (4) recto-sigmoid, (5) generalised carcinoma. Of these, carcinomata of the ampulla, *i.e.*, about three inches from the anus, are the commonest, constituting about half the total number of cases. A growth is rarely discovered until it is two or three cm. in diameter. It then forms a circumscribed nodular, or fungating mass, an indurated plaque, or an ulcer with hard rugose edges. It is nearly always found on the anterior or posterior wall of the rectum, rarely laterally. Secondary nodules are occasionally found above or below the primary growth, or on the opposite wall of the rectum; these are probably due to direct infection or grafting.

However it begins, sooner or later it nearly always spreads in a circular manner, probably following the lymphatic and venous plexus which form a circular network around the gut. It thus tends to produce a stricture.

A diffuse form occurs, beginning beneath the mucous membrane and infiltrating the whole rectal wall, converting it into a tube with rigid walls and an ulcerating surface; this form often extends high up the rectum.

The circumscribed form may become diffuse. Whether the primary disease is circumscribed or diffuse, it seldom remains long without ulcerating. The ulceration may spread and give rise to an ischio-rectal abscess, with the formation of fistulæ. Severe hæmorrhage may result in some cases from the extension of the ulceration into the vessels of the rectum. Hæmorrhoids also are frequently found, owing to the pressure on, or blocking of, the veins by the growth.

The growth may spread directly and invade the bladder

and prostate in males, and the uterus and vagina in females. More rarely the sacrum is involved. Sometimes the ureters are invaded and compressed. The peritoneum may be secondarily infected.

The lymphatic glands in the concavity of the sacrum and the lumbar glands are most frequently affected secondarily. The inguinal glands are often involved, especially in epithelioma of the anus. Those glands situated in the region of the internal iliac artery are also affected occasionally. Diffusion of the growth is rare, but the peritoneum, liver, kidneys, lungs and even bones are sometimes affected.

The duration of the disease is seldom more than two years, although instances have been recorded in which the symptoms have existed for as many as five or six years. On the other hand, patients sometimes die within a few weeks or months of the first appearance of symptoms of rectal affection.

Most authorities agree that there is very little difference in the relative frequency of the disease in males or females. Williams (*loc. cit.*) found that in 257 cases there were 130 males and 127 females.

The rectum is one of the places where carcinoma occurs occasionally at a very early age. Czerny (*Münch. Med. Woch.* 96, No. ii.) records a case in a girl *æt.* thirteen years. It is, generally speaking, a disease of mid life and old age.

Hæmorrhage, constipation, abdominal distention, referred pain in the perineum and shooting down the backs of the thighs are the symptoms that usually call the patient's attention to the disease.

The diagnosis is generally confirmed by making a rectal examination with the finger.

The situation and extent of the growth, its mobility—that is, its relationship to the surrounding structures, and whether the lymphatic glands in the concavity of the sacrum are involved, can generally be made out. Bi-manual examination, either per rectum or per vagina, may help with high-lying growths. A rectal speculum, in the form of a tube one inch in diameter and ten inches in length, passed with the patient in the genu-pectoral position, may also be used.

In doubtful and difficult cases a colotomy incision in the left inguinal region may be made, large enough to insert the surgeon's hand, and the abdomen explored through it.

(This proceeding is of great value in a case where the surgeon intends to do a colotomy before removing a growth; by its means much information is obtained as to the extent of the growth, the involvement of glands, and the presence or absence of secondary growth in the liver.)

Simple or tubercular ulceration and stricture are sometimes difficult to diagnose from carcinoma. In a doubtful case a piece of the growth should be removed and microscoped. Tumours outside the bowel wall can be excluded, if they can be felt with the finger, by the fact that the mucous membrane is freely movable over them.

Choice of cases.—If the growth be limited to the gut, mobile, and the glands without appreciable enlargement, it can be removed wherever it is situated.

Preparation for Operation.—This chiefly consists in an attempt to disinfect the rectum. Sepsis is not possible, but diminished septicity is. For a week before the operation the motions are kept soft with gentle laxatives—*e.g.*, confection of senna or cascara sagrada; violent purgatives are contra-indicated. The diet is regulated as advised for intestinal resection (see p. 262). Duplay and Reclus (*loc. cit.*) recommend that two grammes of naphthol shall be taken daily, and that the rectum shall be washed out with naphthol water, or permanganate of potassium $\frac{1}{1000}$. The field of the operation is shaved and cleansed twenty-four hours before the operation.

The question of a preliminary colotomy may be well considered here. Its advantages are:

1. Better disinfection of the rectum both before and after the radical operation, with consequently less risk to the patient as a result.

2. That the surgeon can explore high growths in the pelvis and ascertain the condition of the sacral and lumbar lymphatic glands.

Its disadvantages are the formation of an iliac anus, and the fact that it sometimes upsets nervous and feeble patients very greatly. In patients of this class it is better to do the colotomy and excision at the same time (if a colotomy is decided on). If the patient is not nervous it is best to do the colotomy early—*i.e.*, two weeks before the excision. Colotomy, of course, is not necessary when, as in the case of a growth situated low down it is easy to fix the upper end of the bowel

to the skin, or in a small high growth where the sphincter can be safely left.

Taking all these facts into consideration, together with the frequency with which incontinence of fæces, or stricture, result after excision, one may safely recommend a preliminary colotomy in large and difficult cases.

I would advise the surgeon here not to make everything pivot on asepsis, but to remember that the most important thing is to completely remove the growth. All the precautions for lessening the shock of the operation mentioned on p. 241 must be taken.

Methods of Operation.—The distance the growth is situated above the anus really decides the method of operation.

Excision of the growth per vias naturales.—In very rare instances, where the growth is limited to the wall of the bowel and situated very near the anus, this method is possible, but if the tissues of the ischio-rectal fossa are invaded, or the sacral lymphatic glands enlarged, it is useless. The patient is placed in lithotomy position; the legs are held by assistants, or by means of Clover's crutch. The buttocks are raised on a pillow and brought to the edge of the operating table, so as to bring the parts as thoroughly as possible towards the light. The operator sits or stands. The anus is dilated. The growth drawn out and fully exposed. The healthy wall of the rectum above the growth is first held by forceps, then cut through in a circular manner with scissors, at least half an inch of healthy bowel wall above the growth being removed with it. The bleeding points having been ligatured, the wall of the rectum half an inch below the growth is cut through and the mass and bowel wall removed. After the hæmorrhage has been stopped, the upper end of the bowel is sewed to the skin, the sphincter is preserved.

Excision from the perinæum.—For this operation the growth must be limited to the lower three inches of the rectum, for the reflection of the peritoneum generally extends to within three and a half to four inches of the anus.

The patient is placed in the same position as is recommended for excision *per vias naturales* (see above.) The cleansing process is repeated, and the rectum stitched up or plugged with antiseptic gauze.

The left hand of the operator is placed on the right side

of the buttock, so as to draw down the anus and tighten the tissues at its margin, and, with an ordinary scalpel, a crescentic incision is made around the anus on each side, and continued backwards in the middle line to the tip of the coccyx. If this incision can safely be made within the bowel, between the two sphincters, or the less the integument is interfered with, the better for the patient, so far as the integrity of the anus is concerned; but the main reason of the operation—the removal of the whole of the disease—must ever be kept in mind, and every other consideration must be subordinate to it. The crescentic incision should be so deep that it opens the ischio-rectal fossa; into it the forefinger is thrust, and the bowel is separated by tearing and breaking down the tissues, until the levator-ani is reached, which is divided with scissors. When the bowel has been thoroughly separated behind and at the sides, the anterior connections are attacked, and here the greatest care is necessary to avoid opening the urethra, the vagina, &c. The dissection is made with a knife or scissors, or a combination of the two, and great assistance may be obtained by introducing a metal catheter in the male, or the operator's or an assistant's finger into the vagina in a female, so that the limit to which the dissection can be carried with safety is easily perceived. The difficulties of this part of the operation are far greater when the disease is situated on the anterior wall of the rectum, and the tissues are consequently much more adherent than natural. The assistant may afford great help to the operator by drawing down the bowel as the tissues are separated. When the separation has been carried well up beyond the disease, the bowel is drawn down and secured with strong guarded angled clamp forceps one inch above the growth; these clamps, combined with packing iodoform gauze round the wound, will prevent infection. The rectum is cut through with a pair of curved, blunt-pointed scissors close to the clamp and the end disinfected thoroughly with perchloride of mercury solution $\frac{1}{1000}$. The hæmorrhage during the earlier steps of the operation, which is seldom considerable, is controlled by the pressure of sponges or by Wells' clamp forceps.

Cripps points out that most of the blood during the separation of the posterior and lateral portions of the bowel proceeds from vessels which are seated in the *walls of the rectum*, so that the grasping of the bowel, which is almost necessary for

the performance of the operation, suffices to arrest the hæmorrhage.

If the peritoneum has been wounded the opening is closed with sutures, or a tampon of iodoform gauze is placed in the opening. The cut end of the rectum is now drawn down, and held securely, while the clamp is taken off and bleeding points secured. The whole wound is now examined and left clean and dry.

The question of bringing down the cut edges of the rectum and stitching it to the skin around the anus must now be considered.

Cripps considers this useless and harmful, as the sutures will, firstly, prevent the free escape of discharges, and, secondly, are certain to cut their way out.

Volkmann, Czerny, Ball and others recommend the use of sutures to shorten the period of healing and obviate the tendency to stricture. They should be of silk and passed through the wall of the rectum, then deeply through the surrounding pelvic structures and out through the skin, thus obliterating any of the pocketing which necessarily occurs if the skin and rectal wall only are sewn together.

Drainage tubes should be put in between the sutures anteriorly, posteriorly and laterally. The deep sutures may now be tied and reinforced by superficial sutures. This should only be done if no fæcal infection of the wound has occurred.

If fæcal infection has occurred no sutures are used, and the whole wound is lightly packed with iodoform gauze and dressed when necessary.

The bowels should be opened towards the end of the first week.

Kraske's Operation, or Sacral Proctectomy.—This was first introduced by *Kraske* (*Archiv f. klin Chir.* Bd. xxxiii. s. 563), but it has since been modified by Kraske himself and numerous other surgeons. It is suitable for cases in which the growth is situated too high for perineal excision, and too low for abdominal section.

Careful preparation of the patient beforehand is absolutely necessary (see p. 278). All possible preparations against shock should be taken. The parts are again carefully cleansed and the rectum plugged with gauze or sewn up. The description of the operation is taken mostly from *Jacobson* (*Operative*

Surgery, p. 1091) and *Kelsey* (*New York Med. Journ.* vol. ii. 1895, p. 457).

"The patient is turned on to his face, but if the anæsthetic requires that the patient lie upon one side, the right is usually chosen. Whatever be the position, the pelvis should be elevated, so as to diminish hæmorrhage. An incision is then made in the middle line from the posterior edge of the anus to the centre of the sacrum, the knife being carried down to the bone at once. A flap on the left side is then turned outwards, including a part of the gluteus maximus, and exposing the side of the sacrum and the sacro-sciatic ligaments. These last must be divided and detached from both sides of the coccyx and the left side of the sacrum, together with the coccygeus, part of the left pyriformis, and, if the anal region is to be removed, the sphincter and levator ani. With a periosteal elevator passed under the sacrum, the soft parts are now detached from the hollow of this bone, including the sacra media vessels and the venous plexus, thus avoiding troublesome bleeding. The surgeon must now explore the limits of the growth and decide how much bone requires removal. We will suppose a somewhat extensive case. The soft parts being vigorously retracted, the surgeon, with a chisel, gouge, forceps or saw, cuts through the left side of the sacrum along a curved line commencing on the left edge, at the level of the third posterior sacral foramen, and running inwards and downwards through the fourth foramen to the left corner of the sacrum. By cutting along this line the anterior division of the third sacral nerve will not be divided nor the sacral canal opened. The bleeding up to this time, which is largely venous, is best met by firm sponge or finger pressure; much time will be lost in attempting to seize the bleeding points in the usual way. As soon as the bone is cut, the vessels may be closed by forci-pressure, or, where needful, by under-running. The hæmorrhage comes chiefly from the lateral and middle sacral, the hæmorrhoidal arteries, the bone itself, and a venous plexus on both aspects of the sacrum. The pelvis is now freely opened, and from six to eight inches of the bowel may be removed. The lower part of the gut may be preserved if it is healthy. In any case the rectum is next to be isolated with the finger. Unless matted by extension of the disease, it will readily be shelled out of its bed, posteriorly and

laterally." Dr. Kelsey says: "The finger cannot be passed completely under and around the gut on account of its size at this point, nor can it be drawn down at all on account of the firm attachments of the peritoneum and the meso-rectum. Any forcible attempt to drag it down at this stage is attended with great risk of rupture and consequent soiling of the wound, and all that should be attempted is gentle isolation on each side by separating it from its loose attachments with the finger, and discovering by touch the extent of the disease to be removed, which can generally be easily done by palpating the tube as it lies in the wound. The next step in the procedure should be the deliberate opening of the peritoneal cavity as near as possible to the bottom of the recto-vesical or recto-vaginal fold. This is not always quickly accomplished, as the peritoneum is often covered by a considerable layer of connective tissue, and this may be nicked several times at various points before an entrance into the peritoneal cavity is effected, As the operator stands on the left, unless he is ambidextrous, the most favourable point for opening into the cavity will be to the right of the gut, high up in the incision, as the gut is held over to the left side by an assistant. Care must be taken, as the knife or scissors are used, not to cut into the gut itself instead of into the sub-peritoneal connective tissue. When once the peritoneal cavity has been opened the right index finger may be passed into the cavity, hooked under the gut from right to left, and forced out of the peritonæum again on the left side of the gut and into the wound. In this way the upper rectum surrounded by its peritoneal layer, with its torn margin, which went to make the *cul de sac*, comes into the wound, and the gut is freed from one of its strongest suspensory ligaments. The rectum is now held from coming down only by the meso-rectum, and while gentle traction is made upon the gut as I have described, this last obstacle may be cut away, but this, like every other step in the operation, should be done with precision and without violence. It must be borne in mind that the nutrition of the upper end of the rectum after the removal of the disease will depend entirely upon the tissue which is now being cut, and this nutrition should be interfered with as little as possible. The bowel should not be forcibly stripped off from the mesentery and connective tissue, leaving it a mere tube without sources of

nourishment, but the mesentery should be divided with scissors at some little distance from its attached border, so that any vessels coming from higher up and running parallel with the gut may be saved. Large veins may be divided between double ligatures. The rectum has now been rendered freely movable, and the time has come to resect or amputate the diseased portion. By palpating the gut from without, the upper limit of malignant disease can easily be determined. Before dividing the gut a ligature of gauze or an intestinal clamp should be applied above and below the point of section, and the wound should be carefully protected with layers of gauze. The cut ends should be carefully wiped with pledgets of gauze and disinfected with $\frac{1}{1000}$ perchloride of mercury solution, and the upper one should be entrusted to an assistant, who, by covering it with gauze and holding it out of the way, will keep it from infecting the wound. The lower end, held firmly by the operator, must then be rapidly dissected from its remaining anterior attachments, and either clamped above and below and then cut off below the disease and united by sutures, Murphy's button or bone bobbin, or removed with the anus. In most cases of disease within reach of the finger by rectal examination, the latter will be necessary, and the attachments of the levator on both sides must be cut. Bold and rapid dissection at this stage will save much bleeding.

During all this part of the operation the constant danger of infecting the wound with the contents of the divided bowel must be scrupulously guarded against. Up to this time complete asepsis is easy, but at this stage it is very difficult, and yet the life of the patient depends most certainly upon its being done successfully, for fouling the wound with intestinal contents means high fever, prolonged suppuration, and a very high death-rate.

The diseased portion, after removal, should be carefully examined by an assistant. At least an inch of healthy gut should always be removed above the upper limit of the cancer. No hæmorrhage need be feared in dividing the bowel. Unfortunately it is never too well nourished, and a bleeding vessel or two in section is always a good sign.

The next point to be decided is what to do with the upper end of the gut, whether to bring it down to the skin and suture it in the perinæum, or suture it to any part of the rectum

which may have been left below, or to bring it out in the middle of the skin incision and suture it just below the stump of the sacrum. This is always a delicate point, and except in cases of disease high up, where a distinct resection, and not an amputation, has been done, and where some sort of end-to-end union is to be attempted, the location of the new anus will have to depend more upon the nutrition of the upper fragment than upon any preconceived idea of the operator. If the loose end of the gut seems well nourished, and can be loosened from its attachments sufficiently to allow of its being stitched to the perinæum to form an anus in the normal place, it will be a great advantage. If, on the other hand, the segment is pale and bloodless in section, if, in order to get it down at all, the mesentery has been freely divided, it is much safer to bring it out behind, under the cut edge of the sacrum, and attach it to the skin. Of course an anus in the perinæum is much more satisfactory than one in the sacral region; but next to the danger of infecting the wound during the operation comes the danger of sloughing of the end of the gut after the operation, and infection of the wound from this cause, and it may easily happen that an operation will be fatal in this way which would have been successful had the operator been content with a little less perfect after-result."

Gersuny (*Centralbl. f. Chir.* 1893, p. 553) twists the rectum spirally through 180° to 270° before sewing it to the skin, and so forms a sort of elastic resistance to incontinence of fæces.

Keen (*Treatment of Cancer of the Rectum*, New York) has twice successfully sewn up the cut end of the rectum after performing a preliminary iliac colotomy.

Quénu has three times successfully first performed an iliac colotomy as near as possible to the upper end of the rectum. Then, after resection by the sacral method, he introduces a solid guttapercha sound, with a deep groove close to its end, into the lower colotomy opening, and passes it down to within an inch of the upper margin of the growth. A strong ligature is then tied round the rectal wall so as to bind it firmly into the groove in the sound. Then the rectum is cut through below the ligature, and disinfected, and the sound gently pulled up with the rectum attached. The cut end of the bowel by this means being invaginated and drawn up and out of the lower colotomy wound, is retained there. If the meso-rectum

will not allow this to be completed, a sacral anus is formed. Both Keen's and Quénu's methods leave the patient with a single anus in a good position, and they both speak of the satisfactory condition of the patients after the operation.

Many operators have done osteo-plastic resections of the sacrum and have replaced the bone; these proceedings have not met with general acceptance.

Morestin (*Thèse de Paris*, 1894) shows that the innervation of the sphincter is nearly always destroyed in resections of the rectum, and that the removal of the whole lower segment is more rapid, safer, and, on the whole, gives better results.

Hochenegg invaginates the stump of the rectum into the lower segment of the gut, drawing it out through the anus, and attaches it to the skin.

When the surgeon has dealt with the end of the rectum, the peritoneum must be sewn up and the meso-rectum as far as possible restored, to prevent prolapse in the future. If the patient is too collapsed to allow of this the wound is closed with iodoform gauze. After cleansing carefully the whole wound, and stopping all the bleeding, it is loosely packed with whatever dressing the operator prefers, careful attention being paid to the drainage of the deep pockets.

After-Treatment.—The cardinal point of the after-treatment is the asepsis of the wound. This is more difficult to attain than it is during the operation. The bowels should be kept from acting until the sixth or eighth day, and, when opened, a mild laxative should be given, or a troublesome diarrhœa may be started. If circular suture or a Murphy's button has been used, laxatives should be given early, in order to prevent the fæces getting solid.

The plugging in the wound should be removed in forty-eight hours and replaced with fresh dressings if necessary. If the wound is kept aseptic, it will heal rapidly; if it becomes septic, irrigation with some efficient antiseptic and careful drainage are the only means to prevent the inflammation spreading. If the newly-formed anus shows signs of contracting, the passage of the finger or a bougie, daily, will prevent the formation of a stricture. If there is incontinence of fæces one of the many forms of pad or truss must be worn.

The Abdominal-Perineal Excision.—This was first performed by Czerny in 1883, and is suitable for growths situated at the

junction of the sigmoid flexure with the rectum, that cannot be removed by the method of Kraske or through an abdominal opening.

Quénu (*Soc. de Chir.*, November 4, 1897, reference given by Duplay and Reclus, *loc. cit.*) describes this operation.

The incision is made at the site of the future iliac anus, and the hand is introduced into the abdominal cavity, and the limits of the growth explored. If it cannot be removed by Kraske's method, or through the abdominal opening, the sigmoid is drawn out of the abdomen, emptied, and two clamps put on it, the lower about one inch above the growth. The bowel is then cut through between the clamps and its ends disinfected and covered with iodoform gauze on sterilised rubber caps. The upper end is left outside the abdomen. The lower end replaced in the pelvis, and the meso-rectum is clamped, divided with scissors, and ligatured. The peritoneum in front of the rectum is cut or torn through as low down as possible so as to liberate the rectum from all its connections. The lower end of the sigmoid is secured to the abdominal wound, the rest of which is now closed and an iliac anus thus formed. This is covered with a pad of sterilised gauze and the patient placed in the lithotomy position. The rectum is now removed through an incision in the perineum as already described (p. 209).

Excision of the Rectum through the Vagina.—Suitable for growths situated not more than 12–15 cm. from the anus.

Heydenreich (*Semaine Méd.* 1897, p. 321) gives the complete statistics of this operation. By dividing the recto-vaginal septum ample room is given. The growth is removed and the recto-vaginal septum re-sutured. The cut end of the rectum is sutured to the perinæum or the ano-coccygeal furrow.

Gersuny (*Centralbl. f. Chir.*, March 10, 1897) gives details of twelve cases operated on by this method, with one death.

Results of Operations.—*Mortality from the Operation.*—Many of the following facts have been taken from *Finet's* (*Thèse de Paris*, 1896) "De la Valeur Curative et Palliative de l'exérèse dans le Cancer du Rectum." He collects 375 cases and gives a complete account of most of the cases and a short account of all of them. The general statistics collected by various authors of the mortality due to excision of the rectum are :

Billroth . . .	608 cases,	mortality	53	per cent.
Gross . . .	193 „	„	20	„
Cripps . . .	76 „	„	17	„
Ball	175 „	„	16·5	„
Kelsey . . .	140 „	„	15·7	„
MacCosh . . .	439 „	„	19·1	„
Veljaminoff . .	335 „	„	20·5	„

The statistics of individual operators are of more value.

For the perineal operation, *Cripps* (*Brit. Med. Journ.* 1892, vol. ii. p. 1277) records thirty-eight cases with three deaths—a mortality of 7·8 per cent.

Czerny's cases from 1883 to 1886 (reported by Lövinsohn, *Beiträge z. klin. Chir.* 1893, Bd. x. p. 223) number sixteen perineal excisions with one death—a mortality of 6·2 per cent.; from 1886 to 1891 (reported by Schmidt, *ibid.* 1892, Bd. ix. Heft. ii. p. 409) number thirty-two perineal excisions with one death—a mortality of 3·1 per cent.

Czerny's thirty-six sacral excisions, with seven deaths—a mortality of 19·4 per cent.

Taking all Czerny's cases from 1878 to 1891 (including Henck's published statistics, twenty-five cases from 1878 to 1882) together, there were 109 excisions with ten deaths.

Ball (*loc. cit.*) from 1884 to 1893 reports nine cases of perineal excision with three deaths—a mortality of 33·3 per cent. Also four cases of sacral excision with no deaths.

Kocher (reported by Arndt) in thirty-five cases had ten deaths—a mortality of twenty-eight per cent.

König (reported by Hildebrand) in fifty-four cases had twenty-one deaths—a mortality of thirty-eight per cent.

Billroth's total mortality was thirty-four per cent. and *Albert's* eighteen per cent.

Quénu (*Soc. de Chir.* Paris, November 4, 1897) reported eight cases of recto-sigmoid excision by the abdomino-perineal or sacral method, performed by Czerny first in 1883, Chalot, Bœckel, Quénu, Giordano, Reverdin, Gaudier (two cases), with four deaths—a mortality of fifty per cent.

Finet (*loc. cit.*) collects sixty deaths from excision of the rectum; of these forty-five were due to septic infection, seven to collapse, two to hæmorrhage, two to embolism, and in four cases the cause of death was not recorded, the patients dying between the fourth and nineteenth days after the operation.

Obviously sepsis is by far the most important factor in the death rate; the other causes need hardly be considered.

Kelsey (*loc. cit.*) says: "Exactly in proportion to the thoroughness of this disinfection (*i.e.*, of the field of operation) and to the care with which the wound is kept clean during every stage of the operation will be the mortality." I can only add "and after the operation as well." Reduction of the death rate in this operation, as in all other operations on the alimentary canal, means asepsis. Although, as I have already stated, the most important point is to completely remove the growth.

Cures due to Operation.—It will be convenient, in the consideration of this part of the subject, to take the separate results of several surgeons who have performed a large number of operations for rectal cancer, and afterwards to mass the results in order to obtain a general idea of the relative mortality and prospect of cure in a larger number of cases.

The total results given by Cripps (*loc. cit.*) are the following:

Died of the operation	3
Dead or alive with recurrence	15
Died a year later of other disease	1
Lost sight of within a year	10
Well from one to three years	2
Well more than three years	7
Total	38

Mr. Cripps has recently informed me that he has never known recurrence take place in any of his cases after three years had elapsed. Other surgeons have recorded recurrence three, four and a half, five, and six years after a successful operation, but these are of course great exceptions to the usual rule. They generally followed the removal of primary cancers of very slow growth.

Mr. Cripps's cases are of great interest in one respect. Three of the patients who may be claimed as cured suffered from recurrence after the first operation, and were cured by the second removal.

Czerny's results on forty-eight cases of perinæal excision are the following:

Died of the operation	2
Dead or alive with recurrence	25
Lost sight of	10
Well less than three years	4
Well more than three years	7
Total	48

Including the above statistics and adding to them a number of others, a total of 121 cases may be obtained, which give the following results:

Died of the operation	15
Dead or alive with recurrence	51
Died one year later of other disease	1
Lost sight of within a year	20
Well from one to three years	13
Well more than three years	21
Total	121

Deducting the twenty patients who were lost sight of after the operation, and the one patient who died at the end of a year of some other disease, there remain one hundred cases, with twenty-one cures of over three years. The results are not, of course, nearly so good as they are for some other parts of the body, but they are not bad. The study of the individual cases shows that, although the first operation was not always successful, several of the cures were effected by a second operation.

Then follows the question whether the high operation will afford better results. At present it is difficult to judge on account of the comparatively small number of cases in which the operation has been performed. Czerny has performed the sacral excision thirty-six times, with the following results:

Died of the operation	7
Dead or alive with recurrence	9
Lost sight of within a year	2
Alive and well within two years	12
Well from two to three years	6
Total	36

It will be seen that the results are rather prospective than actual, on account of the comparatively short period which had elapsed since most of the operations were performed.

In order to show what has been effected by excision of the rectum for cancer, Duplay and Reclus (*loc. cit.*) have collected a number of cases from various sources. I tabulate them here:

Lived three years after operation	15
Lived four years after operation	19
Lived five years after operation	13
Lived six years after operation	6
Lived seven years after operation	4
Lived eight years after operation	4
Lived eleven years after operation	3
Lived respectively thirteen, fourteen, sixteen and sixteen and a half years after operation	4

The results of operations in relation to affection of the lymphatic glands behind the rectum will certainly occupy the attention of surgeons in the immediate future. At present, there is very meagre information regarding the possibility of cure in cases in which the glands are already involved; and it is not even known, in most cases of recurrence, whether the recurrence is an actual recurrence of the disease which was removed, or whether it is due to secondary affection of the lymphatic glands.

Does the operation tend to give the patient a more comfortable life?—In the consideration of this question several common sequelæ to the operation of excision of the rectum must first be considered.

1. **Incontinence of Fæces.**—*Quénu* remarks that, though at first, in perineal excisions, there is absolute incontinence after excision, little by little the intestine seems to gain power of retaining fæces.

After sacral excisions, even where the sphincters have been retained and the two ends of the bowel united, there is often incontinence, owing to the interference with the nervous mechanism. Also, in these cases, a posterior fæcal fistula often forms, and though it sometimes closes, it not infrequently enlarges until it forms the sole exit for the fæces.

Following Gersuny's plan of twisting the rectum 180° to 270° and then fixing it to the skin, Gersuny, Ball, and Chaput record successful results. This is contra-indicated when the end of the rectum is short or difficult to draw down. Nutrition is obviously impaired by this proceeding.

Krönlein (reported by Stierlin). In 17 cases 1 case had complete incontinence, 13 had relative continence, 3 had complete continence. Of these 3, in 1 the sphincter was only dilated, in 1 it was only divided, and in 1 Kraske's operation was performed.

König, in 21 cases, observed in 37 per cent. relative continence, in 47 per cent. complete incontinence, in 16 per cent. absolute continence.

Cripps states that in 36 cases, in 7 complete incontinence, in 23 complete continence, in 6 relative continence.

Bergmann (reported by Schwieder) says that, though no special attempt was made to prevent incontinence, he has never known a patient so inconvenienced by incontinence as to regret having undergone the operation.

2. **Stricture following Excision.**—*Stierlin* has not found any inconvenience from this.

König and *Czerny* found it occur in one case out of every five.

Paul, in fourteen cases, only noticed it once.

Jones Platt, in twenty cases, noticed it once.

This stricture naturally follows if the whole of a large wound heals by granulation; and treatment by bougies is necessary during convalescence, as a rule, in such cases, to prevent it.

Bramann, in twenty-three cases, has not observed it once.

The general opinion seems to be that a stricture should not be treated as long as it allows of the introduction of a finger.

In sacral operations stricture is more frequent, and difficult to prevent. After circular suture a sacral fistula often occurs, and a stricture forms at the point of union of the bowel.

Finet collected 112 cases of circular suture, invaginations (method of Hochenegg), and cases of sacral ani, and found stricture in thirteen of them.

It is best prevented by obtaining union by first intention. If it occurs, dilatation by bougies, or rectotomy will relieve it.

Prolapse of the Rectum after Excision.—This was a rare complication before the introduction of Kraske's method.

In 1889 *Stierlin* observed it once in twenty-five cases. It was a prolapse of the anterior wall of the rectum following on extensive resection of a growth on the posterior wall.

Jones Platt observed it once in twenty-one cases, in a case in

which a small resection for a growth was done. The patient had suffered from prolapse before the operation.

Czerny in 109 cases did not observe it once.

Paul in fourteen cases observed it twice; eleven of the cases were sacral operations.

Morestin observed it four times.

Finet, in 112 sacral operations collected by him, found it in twenty-one cases; nineteen of these were sacral ani.

It is due to the operation destroying the natural support of the rectum. Paralysis of the sphincter and levator ani will, at most, only produce slight prolapse of the mucous membrane. Destruction of the meso-rectum is necessary to produce a large prolapse, together with the absence of the sacro-coccygeal bony curve to resist the expulsive force of the abdominal muscles.

Probably one of the best ways of preventing this prolapse is to carefully stitch the visceral and parietal layers of the peritoneum together, and so reconstitute the meso-rectum.

Sometimes by partially preventing incontinence, prolapse is not so great an evil as it might appear to be.

When we have taken all these sequelæ into account and included recurrence *in situ*, I think it may fairly be said that the patient's comfort is increased and his life prolonged by the operation. In the statistics that have been given, many of the cases classed under "Died or alive with recurrence" lived for considerable periods of time, five and a half, seven, and even eight years after the original operation. The average duration of life in the cases dying of recurrence is about two years. The distressing ulceration, discharge, hæmorrhage, involvement of the bladder or uterus, protrusion of the growth, which occur, even if colotomy has been performed, make up a strong case for excision, particularly as there is a fair chance of completely curing the disease. Most of the continental surgeons have given up the extensive operations which have been performed, such as the removal of portions of the bladder, prostate, uterus, and other structures, together with the growth. The English surgeons have never been in favour of these methods.

Conclusions.—In cases where the growth is limited to the bowel wall and can be completely removed, I think that it ought to be removed whenever it is situated in the rectum.

The great point in the sacral operation is that it enables the surgeon to thoroughly remove all the sacral lymphatic glands,

and so brings excision of the rectum into line with operations for cancer elsewhere.

The perfecting of the technique of the various operations is going on still, and is lowering the mortality, and will doubtless lower it still further. The prevention of post-operative infection of the wound is a most difficult problem. The various attempts that have been made to join the upper to the lower end of the rectum have generally failed to attain the desired result, *i.e.*, restoration of natural defæcation.

In cases where the growth has passed the limit of the bowel wall and become adherent to other structures in the pelvis, or in large, rapidly growing tumours in young people, more relief will be given if a left iliac colotomy is performed.

The statistics given are favourable enough to warrant a surgeon to strongly urge patients in carefully selected cases to undergo the operation of excision of the rectum.

CHAPTER XXIII

KIDNEY

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The kidney may be the seat of either carcinoma or sarcoma. The former disease occurs only in adults; the latter may attack infants, children, and adults, but is uncommon in the young and middle period of adult age.

In adults there does not appear to be a wide or essential difference in the course of the two diseases. The duration of the symptoms may be from a few months to several years, but the shorter periods are more common than the longer. The tumour may be confined for a long time within the capsule of the organ, and may even be encapsuled in the interior of the kidney, so that the structure of the tumour is separated from that of the portion of the kidney which is still unaffected by the disease; or—and this is more usual—it may infiltrate the whole or a large part of the kidney structure. In the course of time it may grow through the capsule into the surrounding parts. The lymphatic glands behind the peritoneum in front of the spine are liable to be affected both by sarcoma and carcinoma, and secondary growths may be found in the lungs, the liver, and other organs and tissues; in addition to which there may be disease of the other kidney. The frequency with which renal calculus has been found in cases of renal cancer has led to the belief that the cancer is induced by the presence of the calculus.

In children carcinoma has seldom been observed, but sarcoma is not a very uncommon disease. It appears in three different forms or under three different conditions: first, as a congenital disease, when a tumour is discovered, often of large sins,

sometimes exceedingly large, composed of striped muscular fibre mixed with fibrous and sarcomatous tissues. Such tumours are usually perfectly encapsuled, separable without much difficulty from the surrounding tissues, and not associated with affection of the lymphatic glands or with secondary growths in any other part of the body. Moreover, the disease is limited to one kidney. The children usually die at an early age, seldom living to the age of two years.

Second, in the form of a sarcomatous disease of a single kidney, forming a tumour of so considerable a size that it can be felt through the abdominal walls, and may be diagnosed as a renal sarcoma. The disease attacks young children ; it affects the lymphatic glands and other organs secondarily.

Third, both kidneys may be the seat simultaneously, and to an almost equal degree, of round-celled or lympho sarcoma, which may and often does kill the patient without producing tumours of such a size that they can be felt in the abdomen during life. After death the kidneys are not very greatly enlarged, but the glands in front of the spine are affected so that the disease has already advanced towards generalisation.

It appears probable that in some, if not in many, of these cases of the third class, the disease does not originate in the interior of the kidney, but in the neighbouring glandular tissues, whence it makes its way into the hilum of the kidney. The general disposition of the disease and its lymphatic or lymphadenomatous structure lend support to this view.

It may be mentioned that the disease, whether sarcoma or carcinoma, varies much in its exact origin and relation to the kidney, for it may arise in any part of the organ, or may be situated between the kidney and its capsule.

Methods of Operation.—The only method of operating on a cancerous kidney is to remove it by the knife; but the manner of removing it varies according to whether the incision is made from the front or from the back, or whether the so-called transverse incision is employed.

The *abdominal* incision may be made in the linea alba below the umbilicus, or at the outer border of the rectus muscle. The latter position should always be employed if possible. In a certain proportion of cases, however, the operator, unaware of the exact situation and nature of the tumour he is about to remove, employs the linea alba, as he can

better explore the general peritoneal cavity by this route. The length of the incision depends of course on the size and position of the tumour, and on its relation to surrounding parts. When the abdomen has been opened, the tumour is usually seen at once. The small intestines, if they cover it, must be drawn aside, but the colon is usually fixed more or less closely at its outer border. The peritoneum in front of the tumour is now incised at the outer edge of the colon. It is exceedingly important to make the incision there and not on its inner edge. Several instances have occurred where the blood supply of the colon has been so seriously interfered with as to cause subsequent gangrene of the gut when this rule has not been adhered to. Care must be taken that the tumour, which is often exceedingly soft, is not broken. It should be gently separated from the surrounding tissues by the finger and knife, and all vessels clamped as they are cut so as to diminish as far as possible all chance of short or subsequent hæmorrhage.

The pedicle is best formed of the vessels alone. It should be transfixed with a blunt aneurism needle armed with a stout silk ligature, and tied in the same fashion as the pedicle of an ovarian tumour. The tumour should not as a rule be cut away until the pedicle is secured. Sometimes, especially when the tumour is very large and firmly adherent to the surrounding structures, it is not possible to carry out this plan, and the vessels are first secured with a pair of large pressure forceps, until the removal of the tumour makes it possible to finally secure them. Some operators include the ureter along with the vessels in the pedicle, and provided no septic infection of the kidney has taken place, it is the simpler method of dealing with it. If, however, it seems likely that any infective process has already attacked the kidney substance, it is far safer to make an incision through the back muscles just above the crest of the ilium, at the outer edge of the erector spine, and fix the ureter to the edge of the skin, after having closed it and applied the actual cautery to its mucous lining. A drainage tube can be inserted in the same situation should occasion demand one. The peritoneal opening on the back of the abdomen should now be brought together by a few fine stitches and the anterior abdominal wound closed in the usual manner.

The *lumbar* operation is now usually performed by making an oblique incision parallel with the lower border of the last

rib and about half an inch below it. It was formerly the custom to make a vertical incision in addition, beginning about an inch in front of the posterior extremity of the oblique one, in order to obtain more room. This plan has now been pretty generally abandoned, and the oblique incision is carried forward almost transversely after leaving the extremity of the rib, and may be continued if necessary as far forward as the outer border of the rectus. This incision has been variously described as König's, Abbé's, &c. In reality, however, it has been gradually adopted by a process of evolution by most surgeons who have had much experience in operations on the kidney. The peritoneum need not be opened. If, however, circumstances should render it desirable to palpate the opposite kidney or examine any other of the abdominal viscera, an opening in it large enough to admit the hand can be made without any difficulty. When the kidney is reached it is cleared from the surrounding tissues in precisely the same manner as has already been described in connection with the abdominal operation, and the vessels and ureter are secured in an exactly similar fashion.

Of these two modes of operation each undoubtedly has its disadvantages. It is easier, usually, to see what one is about when operating from the front; on the other hand, the shock is much less when the transverse incision is employed, and the intestines naturally fall away from the tumour as the patient is lying on his side, and do not come in the way of the operator even if the peritoneum is opened, and consequently do not get as much handled. Whilst it is certain that the abdominal operation must still be employed in certain cases, all experience tends to show that, however much we may avoid peritonitis by the precautions of asepsis, shock and collapse will claim some victims, and these conditions can best be provided against by performing as many operations as possible by the transverse route. Schede (*Jahrb. Hamburger Krankenanstalten*, 1889) strongly insists on this view. Perthes (*Über Nierenextirpation*, 1896) supports it, and so also do Küster, Von Bergmann, and Czerny. It is also strongly advocated by Jacobson (*Operations of Surgery*, 1897).

The mere statistical comparison of abdominal and lumbar operations is absolutely worthless, for the simple reason, elsewhere alluded to, that all the worst cases are reserved for the

abdominal operation, and therefore its mortality is, and must always remain, far greater than that which obtains for the lumbar method.

Although the operations, as they are described above, do not sound very formidable, and it may appear particularly easy to remove a diseased kidney of large size through an opening in the abdomen, provided the opening is sufficiently large, and directly over the tumour, experience proves that either operation may be extremely difficult; that the attempt to remove the kidney may be unsuccessful, and may have to be abandoned; and that terrible accidents may occur during their performance. In most instances the soft consistence of the tumour, together with its adherence to the surrounding structures, is the cause of the gravest dangers. So long as the capsule is not broken, and the tumour can be separated entire in its capsule, even though this may occupy a very considerable time, all may go well; but if the capsule is torn, the soft material of which the mass is often composed escapes, the operator is in danger of mistaking the interior of the tumour for the surrounding parts, the hæmorrhage is profuse, and the operation will probably never be concluded successfully. As an example of the most terrible of accidents, the aorta was severely wounded in one instance recorded by Czerny, was tied, and shortly afterwards the patient died.

Results of Operations.—*Deaths due to Operation.* The earlier results of nephrectomy for malignant disease were collected by Gross (*Amer. Journ. Med. Sci.* July 1885). They include the earlier tables of Barker (*Med. Chir. Trans.* lxiii.) and Czerny (*Trans. Int. Med. Congress*, 1881).

Dr. Gross collected the records of forty-seven nephrectomies for sarcoma and carcinoma, performed on patients of both sexes and of various ages. Twenty-nine of the patients died of causes more or less directly connected with the operation, and eighteen recovered. Thirty-three of the operations were performed for sarcoma, with nineteen deaths and fourteen recoveries; fourteen were performed for carcinoma, with ten deaths and four recoveries. The mortality of the operations for carcinoma was, therefore, much larger than of those for sarcoma. The number of cases of the two diseases is of course not equal, and it might happen that an equal number would give different results. But this is not probable; for it

appears that carcinoma of the kidney is on the whole more malignant than sarcoma, is more prone to form early and extensive adhesions, and is consequently more difficult to remove without serious damage to the surrounding important structures.

The causes of death were given in twenty-eight of the twenty-nine fatal cases. Nine patients died of shock, three of hæmorrhage, and three of exhaustion; fifteen of the twenty-eight, therefore, of causes which are particularly the results of large and formidable operations. Of the remaining thirteen, one died of "metastasis," by which it may be imagined that it is intended to convey that the death was rather due to the disease than to the operation, and I do not quite know why this death has been placed among those due to operation, unless it be that the patient died so speedily after the kidney was removed that the operation, not the generalisation of the disease, was the direct cause of death. One patient died of pulmonary embolism, and one of tetanus. Three died of uræmia or anuria; a small number when it is remembered that the operation was removal of the kidney. But apparently these are rare causes of death after nephrectomy, unless the other kidney is diseased. Two died of septicæmia, and five of septic peritonitis. The number of instances of septicæmia and septic peritonitis will not appear so small in proportion to the total number of deaths due to the operation, when it is taken into account that fifteen of the twenty-eight patients were, so to speak, killed outright by the operation, before they had time to exhibit symptoms of septic poisoning; or the symptoms of septic poisoning were lost sight of in the more marked symptoms of shock and hæmorrhage and urinary trouble.

The death rate on the total number of cases was enormously large, more than sixty per cent.; for carcinoma more than seventy-one per cent.

Cures due to Operation.—The successful cases were even more easily disposed of. For the operations for sarcoma, the results for the fourteen survivors of the operation were: one died of an unknown cause, one was living with recurrence at the end of four months, and five died of the disease in from five to eighteen months after the operation. Two were lost sight of; and five were alive and well at the end of seventeen,

twenty-two, twenty-three, thirty-five months, and five years. The thirty-five months may fairly be stretched to three years, so that we may count two complete cures in the total number of cases. Not one instance of cure or even of long relief was recorded in the cases of children. Of the seven children who survived the operation two were lost sight of, and four of the remaining five were alive or dead with recurrence within a year of the operation, only one living so long as eighteen months.

The results of operations for carcinoma were even worse than those for sarcoma. Four patients recovered from the operation, of whom two died of secondary growths within two months of their recovery; one was alive and well at the end of two months, the other at the end of thirteen months.

Two only of the eighteen individuals who recovered from the operation were alive at the end of three years. The total results derived from Gross's paper were, therefore, sixty per cent. of deaths due to the operation and four per cent. of patients cured.

Later Results.—In his work on "Surgical Diseases of the Kidney," 1888, Newman has collected sixty-one cases, twenty-five of which were performed for cancer and thirty-six for sarcoma, with the following results.

Of the twenty-five which were performed for cancer, eleven recovered and fourteen died (mortality fifty-six per cent). In nine cases the lumbar operation was performed with two deaths; in fourteen cases the abdominal operation with eleven deaths, and in one case which recovered the nature of the operation is not stated.

Of the thirty-six cases of sarcoma, seventeen recovered and nineteen died (mortality fifty-three per cent). In eight instances the lumbar operation was performed with five recoveries and three deaths, in twenty-five cases the abdominal operation with eleven recoveries and fourteen deaths. In three cases in which the nature of the operation is not stated, two died and one recovered.

The causes of death are tabulated as follows: Shock and collapse, nine; pyæmia, one; uræmia, two; peritonitis, nine; pulmonary thrombosis, one; strangulation of the bowel, one; recurrence, one; pulmonary œdema, one; hæmorrhage, two; tetanus, one; cause unknown, two.

It is exceedingly questionable how far it is fair to compare the lumbar and abdominal cases which are included in this table. It is obvious that the abdominal operations will include most of the larger tumours, and more difficult cases which were deemed by the operator to be impossible of removal by the lumbar route, so that mere statistical records are almost certain to indicate a far higher mortality for the abdominal than for the lumbar method of operation.

Three years later Knowsley Thornton (*Lancet*, December 1889) describes five of his own cases of nephrectomy with three recoveries and two deaths, and advocates, as might be expected, the abdominal operation. This number of operations is obviously too small to afford the means of drawing any general conclusions.

Schede (*Jahrb. Hamburger Krankenanstalten*, 1889) gives an account of twenty-one cases of malignant disease in all of which he employed the lumbar operation, in which seven died directly from the results of the operation and three shortly after, making a total of eleven recoveries and ten deaths.

Guillet in a valuable thesis (Paris 1888) gives an account of twenty-eight nephrectomies for cancer in which four cases that were operated by the lumbar route all recovered, whilst of twenty-four that underwent the abdominal operation eighteen died and six recovered. He also describes thirty-seven operations for sarcoma, five by the lumbar route, of which three recovered, and thirty-three in which the abdominal operation was performed, in which fourteen deaths occurred.

These cases are collected from French sources between the years 1861 and 1888, and point to much the same conclusions as those which may be deduced from other sources.

Herczel (*Wiener Med. Presse*, No. 42, 1889) gives an account of Czerny's cases at Heidelberg, from which it appears that of twelve cases of malignant disease operated on by him, nine died from the operation, five from collapse, two from peritonitis, one from œdema of the lungs, and one from tetanus. Of the three that recovered, one died two months later, one after six months, and the fate of the remaining one is unknown.

Barth (*Deutsche Med. Woch.* 1892) has tabulated 100 cases of nephrectomy performed for malignant disease by various surgeons, including some of those cases which have just

been referred to. From this table it appears that forty-two died from the operation, twenty-two from subsequent recurrence, and thirty-eight are stated to have been cured. No definition is given of the word "cure," but two of the cases were alive four years after operation, and several more two and three years afterwards. This list includes both lumbar and abdominal operations, and no attempt is made to separate them.

Perthes, "Über Nierenextirpation" (*Deutsche Zeitsch. f. Chir.* Bd. xlii. p. 201, 1896) describes Trendelenburg's results, which are as follow: Twelve cases operated on, three died of the operation and seven from recurrence, whilst two are recorded as recoveries. The abdominal operation was only employed where the lumbar route did not seem to afford sufficient room.

In children the results of operations for malignant disease are not so good as in later life: the chances of speedy recurrence are greater. At the same time it is absolutely certain that far better results are now obtained than was formerly the case. In the *Lancet* for December, 1889, Knowsley Thornton wrote: "I have seen several operations for renal sarcoma in children, and each has impressed strongly on my mind the uselessness of the procedure. With adults the reverse is the case. The difference is to be sought (1) in the varieties of sarcoma most common in early life, and (2) in the portion of the organ first invaded by the disease." A very complete analysis of sixty cases of operations undertaken for malignant disease in children has been presented by Dr. Emily Lewi (*Archives of Pediatrics*, Feb. 1896). It includes cases from the practice of American, British, and Continental surgeons. Nineteen of the sixty cases died of the operation, ten from collapse, five from peritonitis, two from hæmorrhage, one from ligature of the vena cava, and one from injury to the gut. The deaths occurred chiefly in the earlier cases, and no case of peritonitis is recorded since 1887. In the majority of the forty-one children who recovered from the operation death occurred a few months later from recurrence. Three, however, are reported well after a year, one after two years, three after three years, and one died at the end of five years.

These results are a decided improvement on those recorded by Fischer in 1889 (*Deutsch. Zeitsch. f. Chir.* Bd. xxix. p. 590). Of his twenty-five cases, thirteen only recovered from the

effect of the operation and their subsequent history is untraced.

Czerny's later and far better results are described by Jordan in 1895 (*Beiträge z. klin. Chir.* xiv. Heft 3). Nine cases of nephrectomy for malignant disease without a death. This success is attributed to two causes: the almost exclusive employment of the extra-peritoneal incision, and the avoidance of harm to the remaining kidney by limiting antiseptic measures as far as possible.

At the Moscow Congress, Israel gave an account of the statistics of a large number of operations on the kidney which had been performed by himself. Twenty-four of the operations were performed for malignant disease, with three deaths, a mortality rate of 12·5 per cent. Seven of the patients who recovered died of recurrence. Of the remainder, six had lived longer than three years. These results are so remarkable, so far as cure of the disease is concerned, that one would wish to know more of the details. But the transactions of the Congress are not yet published. Israel attributes his own success to early diagnosis by means of his method of palpation *

* *Palpation.*—As Israel's method of palpation is often referred to, it may be well to describe it, and as nearly as possible in the terms which Israel himself employs in the *Berliner klinische Wochenschrift*, February 1889. The patient is placed on the side opposite to that which is to be examined. In this position the abdominal wall is relaxed to the utmost and the kidney sinks somewhat forward. The knees and hips are slightly flexed. The patient breathes deeply and slowly with the mouth open.

Supposing the left kidney is to be examined, the surgeon stands on the patient's right side, looking towards the head. He lays the fingers of his right hand flat on the left lumbar region, those of the left hand in front, so that the tips of the middle and index fingers rest two finger's breadth below the junction of the ninth and tenth costal cartilages. Then, while the lumbar region is pressed slightly forwards, the patient is directed to inspire deeply, and at the moment when inspiration changes to expiration, the front wall of the abdomen is gently pressed back against the back wall by means of the palm lying quite flat upon it, while a very slight kneading movement is performed by the outstretched fingers. The finger-tips thus glide over the lower edge of the kidney at the moment when it occupies its lowest position at the end of inspiration, and feel the organ rise with expiration, and it is exactly this slight movement which facilitates its perception. From the lowest edge of the kidney—which is very easily recognised, being now under the finger-tips—the surface is palpated, the period of early expiration only being utilised for this purpose, because at this time the kidney is as low down as possible and the abdominal walls are most relaxed.

and cystoscopy; and to the removal of the fat-capsule around the kidney and the lymphatic glands. The only symptoms of malignant disease of the kidney in an early stage are bleeding, for which the cystoscope must be used, and swelling, which can be best detected by palpation.

During the same Congress, Küster of Marburg gave the results of 263 published removals of the kidney for malignant disease, and pointed out that the mortality of the operation had been reduced from sixty per cent. to forty-one per cent. But only nine patients were known to have lived for more than three years after the operation. He could only hope that earlier diagnosis might lead to more favourable results. Perhaps Israel's results may be accepted as a response to Küster's hope.

Conclusions.—Although nephrectomy for the removal of malignant disease of the kidney cannot be regarded as a successful operation, on account of the mortality due to the operation and the very small percentage of cures among those who survive it, there are reasons for hoping that better results may be obtained from it in the immediate future. The mortality due to the operation is already very much lower than it was; and is likely to be still further diminished by careful attention to the diagnosis of the disease in its earlier stages.

Operations for sarcoma have been hitherto much more successful than those for carcinoma; but the diagnosis between the two diseases before removal is very difficult, if not impossible.

Operations on children have been followed by a lower rate of mortality than operations on adults; but the operations have only very rarely been attended with ultimate success.

The best cases for operation are those in which the kidney is not fixed to the surrounding structures, and in which it is possible to remove the peri-nephritic fat and glands.

The lumbar incision is to be preferred in all cases in which it appears possible to remove the kidney through that incision.

CHAPTER XXIV

BLADDER

SINCE Sir Henry Thompson's book on "Tumours of the Bladder" appeared in 1884, these diseases have been made the object of a great deal of attention. We are particularly indebted to Albarran (*Les tumeurs de la vessie*, 1892) and Barling (*Amer. Journ. of Med. Sci.*, 1893) for excellent monographs. From them we learn that the bladder is subject to both carcinoma and sarcoma, but that carcinoma is far more frequent than sarcoma. Also, that squamous-celled carcinoma or epithelioma is the common variety of carcinoma which occurs in the bladder. Men are more liable to the disease than women, and one of the earliest and most constant symptoms is the occurrence of hæmorrhage. The fundus of the organ is the seat of election of the disease, especially (and unfortunately) in the neighbourhood of the openings of the ureters. But the tumour may grow from any part of the interior of the bladder. It is usually sessile, and often occupies, by the time the diagnosis is made, a large area of the internal aspect of the bladder. It grows both on the surface and into the substance of the bladder-wall, and may cause adhesions to the adjacent organs and tissues, particularly to the rectum in man and to the vagina in woman. The peritoneum, also, may be infiltrated by the growth. The glands in the neighbourhood of the bladder are liable to become affected, and so are those in the groins. But affection of the glands does not seem to be a necessary or early consequence of the disease. Metastases in various organs and tissues may occur.

It is very difficult to form a just idea of the duration of the disease, whether sarcoma or carcinoma. In some cases it seems to run its course rapidly. But there are also cases of very long duration, in which the symptoms of carcinoma of the bladder have lasted for very many years, as long as

seventeen years in one, and twenty-four years in another case.

Methods of Operation.—A dozen years ago I was only able to give an account of two cases in which a deliberate attempt had been made to remove by a radical operation a malignant tumour of the bladder. One of the patients had died, the other had survived the operation. There the radical treatment of malignant disease of the bladder had ended. Since that time, operations, many of them very extensive, have been performed by surgeons in many parts of the world, so that Wendel, in the course of last year (1898) was able to put together no fewer than sixty-seven cases in which a part or the whole of the bladder had been removed for malignant disease (*Beiträge z. klin. Chir.* xxi. 243). He divides the cases into those in which total extirpation of the bladder was performed, and those in which a portion of the bladder was resected. No case is included in his collection in which the operation comprised only a part of the thickness of the wall of the bladder. On the other hand, he has included two or three cases in which the disease was not primary of the bladder, but had extended into it from some neighbouring organ. But, as in nearly all these the disease began in the prostate or urethra, I have not excluded them, as it was easier to use the material in Wendel's paper as a whole than it would have been had some of the cases been excluded. I think there are really only two cases in which the disease actually commenced in an organ quite outside the bladder. In almost all the cases in which an account is given of the nature of the tumour, it was a carcinoma, only six cases of sarcoma appearing in the list, so that it is not worth while to attempt to consider the operations as they apply to the two diseases separately.

Total extirpation of the bladder was performed on ten patients, six males and four females. The bladder was exposed through the ordinary vertical incision for supra-pubic lithotomy, or through a transverse incision, or through a combination of the two, so as to form an inverted T. Where it was not possible to perform the operation satisfactorily through this opening, partial resection of the symphysis pubis was performed. The peritoneum, if possible, was separated, so that the operation was extra-peritoneal. If it was wounded, or a portion of it was removed, the edges of the wound were

brought together with satures, and no harm arose from these accidents or complications. The chief difficulty was the disposal of the ureters. In three of the four female cases, they were fastened to the vagina, and the same method would have been employed in the fourth case, had this part of the operation been completed. In one of these cases, Pawlick succeeded in manufacturing a receptacle for the urine by making the vagina continuous with the urethra, and the patient was able to retain her urine quite well. Indeed, she suffered from retention of urine, and was obliged to use a catheter. (*Wiener Med. Blatt.* 1890). In that case, he diverted the course of the ureters into the vagina three weeks before he performed extirpation of the bladder. In most of the cases, the operation was performed at one sitting.

In the male cases, various methods of dealing with the ureters were adopted. They were fixed in the rectum, but the threads did not hold. They were made continuous with the urethra. They were fastened to the edges of the wound in the front wall of the abdomen. No method appears to have been satisfactory.

The operation was in every case severe, and was attended with considerable hæmorrhage, which was for the most part controlled by plugging the cavity with gauze.

Resection of the bladder was performed in fifty-seven cases. In several of them the operation was so extensive that it differed but little from total extirpation, only a fragment of the bladder wall having been left. No one method of performing resection seems to have been regularly adopted, or much more successful than another. But almost all the operations were performed through the abdominal wall. The inverted T incision was frequently employed. But as the transverse cut is apt to seriously impair the strength of the abdominal wall, and therefore to dispose to hernia, the transverse cut of the T was in some cases made over the bone; and, when sufficient space could not be obtained between the recti muscles, the portion of the bone to which each is attached was separated from the rest of the pubes, and the separated portions were, at the end of the operation, set back in their places, and firmly attached to the remainder of the bone. The operation was performed either from within or from without the bladder. In the latter case, the outline of the disease was

determined by manipulation, after the wall of the bladder had been sufficiently separated from its bed, and the affected portion of the wall was freely excised. In the former case, the bladder was opened towards the front, the tumour was drawn well out, the incision made through the bladder-wall well beyond its limit, and into the peri-vesical fat. This method is peculiarly applicable to disease situated in the posterior wall and fundus, because it enables the operator to remove the tumour without widely opening the connective tissue of the pelvis. In either case great pains were taken to make the operation extra-peritoneal. The wound in the bladder was very differently treated by the various operators. If possible, the bladder was sewn up, and the abdominal wound was plugged with gauze. Sometimes both the bladder and the abdominal wound were closed, with the exception of an orifice through which a tube was introduced for drainage. Sometimes the entire cavity was filled with gauze. When the bladder was sewn up, a catheter was introduced by the urethra, and kept in as long as appeared to be necessary.

In those cases in which the ureters, either one or both, were divided, the same difficulties were experienced in disposing of them as in the cases of total extirpation. In eleven of the operations, the disease was so situated that they had to be divided.

Mortality due to the Operation.—Six of the patients from whom the bladder was completely removed died of the effects of the operation, three of collapse, two of uræmia, and one of pneumonia. The mortality on the ten cases was therefore at the rate of sixty per cent. Nor is this to be wondered at, when it is taken into account that the operation can scarcely by any possibility be aseptic or antiseptic, that there is great difficulty in disposing of the ureters, and consequently directing the flow of the urine, and that the attempt is fraught with danger to the function, perhaps to the structure of the kidneys.

The resections were far less fatal. Fourteen of the fifty-seven patients died in the first days after the operation, and two other patients died within a few weeks of cachexy, plus erysipelas, so that sixteen deaths must be attributed to the removal of the disease. The percentage must be calculated on fifty-six patients, because the result of one of the operations is not recorded: it amounts to about 28 per cent.

Collapse, exhaustion, and shock accounted for nine of the deaths, in addition to exhaustion and erysipelas at the end of a few weeks in the two cases to which attention has been drawn. Sepsis was fatal to three patients, pyelo-nephritis to one, peritonitis to one, and pneumonia to one patient. It is particularly worthy of notice that in seven of the cases which ended fatally in the course of the first few days, the ureter had been resected. This shows how much the resection of the ureter adds to the danger of the operation, for there were only eleven instances out of the fifty-six or fifty-seven operations in which the ureter was resected. The percentage of mortality in the operations in which it was necessary to resect the end of the ureter was practically equal to that due to total extirpation of the bladder.

The danger of resection of the ureter appears to be so great that it is probable implication of the ureter in the disease will, in the future, deter surgeons from attempting to perform radical operations for cancer of the bladder.

Cures due to Operation.—Under this heading there is little good to tell. The results of the ten total extirpations were as follows:

Died of the operation	6
Died seven months later, cause unknown	1
Lost sight of within four months	2
Alive and well eight and three quarter years after operation	1
Total	10

The results of the resections were:

Died of the operation	16
Result of operation unknown	1
Alive or dead with recurrence	14
Alive or dead with metastases	2
Died, cause unknown, within three years	1
Lost sight of within a year	15
Well from one to three years	5
Well more than three years after operation	3
Total	57

The three patients who were alive and free from disease more than three years after the operation had survived respectively three and a quarter, four, and five years.

At present, then, the mortality of the resections is more than twenty-eight per cent. and the successful cases not more than six per cent. But as a good many of the operations have only lately been performed, it is certain that the percentage of cured cases will be larger for more extensive series of cases, if the patients are carefully followed up.

Unfortunately, the cured patients may have to purchase life at a very high price. The woman from whom Pawlick successfully removed the whole of the bladder and manufactured a receptacle for the urine out of the vagina and urethra was obliged to use a catheter. The last account of her, eight and three quarter years after the operation, was that she was under treatment in the Klinik. Repeated washing out of the new bladder was needed on account of fouling of the urine by heaped-up epithelium and detritus. Some time previously, three stones had been removed through the urethra, and, since then, she had suffered from incontinence; and an operation was contemplated for the relief of the incontinence. One of the patients from whom resection had been successfully performed by Bardenheuer, was able, at the end of four years, to hold his urine for two hours at a time, and suffered from a hernia through the scar. Two other patients discharged their urine through the front wall of the abdomen and were little better off than patients with extroversion of the bladder.

Under these circumstances it is difficult to determine whether patients who are not cured by operation are benefited by it. Indeed, it is doubtful whether the only successful case of total extirpation was justified by the result, which appears to have been anything but satisfactory.

It is worthy of mention that the tumour in all the successful cases was carcinoma; in three of the four, apparently, epithelioma.

Conclusions.—Thus far, total extirpation of the bladder for malignant disease has yielded results which are not likely to encourage surgeons to repeat the operation.

Partial resection of the wall of the bladder for disease which requires for its removal resection of the end of the ureter or ureters is scarcely more successful.

Resection of limited portions of the whole thickness of the wall of the bladder for disease of limited extent is likely to be practised more frequently in future; and, provided the disease

can be diagnosed at an early period may be attended with a measure of success.

The best cases are those in which the disease is situated in the summit of the bladder or in front, well above the urethra, and in which it has not become adherent to any of the surrounding structures.

If the bladder can be closed immediately after the operation by means of sutures, this is a great advantage.

If it cannot, it may nevertheless close in the course of weeks: for the wall of the bladder is restored after extensive resection in a very extraordinary manner.

CHAPTER XXV

PENIS

THE penis may be the seat of both sarcoma and carcinoma, but sarcoma of the penis is a very rare disease. Miner (*University Medical Magazine*, Philadelphia, 1896–7) reports a case and tabulates ten other cases of the disease which he says are all which are contained in medical literature. Vopel, in an inaugural dissertation, 1896, also gives an account of eleven cases of sarcoma of the penis. From this, it appears that the new growth usually begins in the form of a small nodule, and almost always produces an alteration in the shape of the organ. Curiously, in the majority of cases, the tumour originated beneath the mucous membrane of the urethra. Growth was rapid, and the inguinal glands were affected at an early period. Ulceration of the tumour was rarely observed.

The form of carcinoma which most frequently occurs is squamous-celled carcinoma (epithelioma), which is probably five or six times more common than spheroidal-celled carcinoma. It usually commences in the glans or prepuce, or at the junction of the two; but it may infiltrate the whole thickness of the organ, and in the latter case may extend through the entire length of the penis, or may be limited to one particular part. The disease is rare in persons under thirty years of age, but after that age becomes more common during each decennial period. When a large number of cases is analysed, the disease appears to be most common between the ages of fifty and sixty and between sixty and seventy, and there appears to be a diminished liability to it after seventy years are passed; but the reason, which holds good in the consideration of the liability to cancer generally, is that the proportion of persons after seventy years of age to the total population is very small. In addition to age there can be little question that phimosis,

whether congenital or acquired, predisposes to epithelioma of the penis.

The disease may commence as an ulcer, which may be mistaken for a venereal sore, and the error is only discovered by the deepening of the sore, and the extent and intensity of the induration by which it is surrounded. Or it may take the form of a warty growth, when it is exceedingly liable to be taken for a condylomatous mass: the actual nature of the tumour is discovered only by the surrounding induration, the ulceration which usually occurs early, and the absence of other signs of syphilis. When the disease affects the whole thickness or the substance of the organ, the diagnosis is usually more easily made; for, even if an ulcer is present, which is frequently the case, the induration of the penis is out of all proportion to the size and depth of the sore. In whatever manner the epithelioma commences, ulceration takes place almost invariably and at an early period; epithelioma extends from one part of the organ to another, infiltrating the prepuce, the glans, the body of the penis, welding the different structures together and lending to them the characteristic hardness of the disease. In some instances the urethra is opened and fistulous passages result; in other cases the urethra is narrowed and encroached upon, so that the stream of urine is very slender and passed only with difficulty and pain. If the disease is left to itself it may extend to every part of the penis, may pass from the penis to the scrotum, and may even reach the perinæum and inner aspects of the thighs. Usually, long before this has happened, the glands in the groin are enlarged and hard, and are the seat of secondary affection. Like the primary disease, they, too, are liable to ulcerate with the production of horrible foul sores of considerable depth and extent. The pelvic and abdominal glands are often affected in a direct line from the glands in the groin; and at length the patient dies worn out by the extent of the disease, the size of the tumours produced by it, and the horrible ulcerations. The internal organs and distant parts of the body do not appear very liable to secondary affection; but this statement must be received with caution on account of the few instances in which death has been followed by a careful examination of the body. There appears, however, little reason to doubt that epithelioma of the penis is a local affection attacking the glands in the

groin only after the primary disease has existed in most instances a considerable period, and certainly not affecting the other organs and tissues until late, if indeed at all. The duration of the disease without operation is very variable; in may terminate fatally in the course of a few months, or may last for many years. But the mean duration is said by Demarquay to be from two years to three years and a half.

The scirrhous and encephaloid cancers (spheroidal-celled carcinomata) of the penis which have been recorded are very inferior in number, as has already been remarked, to the cases of epithelioma, and yet I am inclined to believed that the number has even now been exaggerated. It is certain that some instances of epithelioma in which the disease has formed a larger and more important mass than usual have been erroneously regarded as encephaloid cancer. And a similar mistake has been made in some cases in which there has been dissemination of the disease, because there is a general impression that epithelioma has no tendency to dissemination. It is very difficult to distinguish with the naked eye between epithelioma and encephaloid or scirrhous carcinoma, and in many of the recorded instances the microscope has not been employed in the diagnosis. It is, however, probable that both varieties of carcinoma do attack the penis. Clinically, there does not appear to be any essential difference in the course of the disease whether it is spheroidal-celled or squamous-celled carcinoma or sarcoma. It may commence in the same part of the penis, pursue the same course, affect the groin glands, attack persons of the same age, and produce death in about the same time, no matter what the particular form of the disease. The encephaloid and scirrhous carcinomas are said to exhibit greater tendency to dissemination than epithelioma, but I do not know whether this opinion rests on sure grounds.

Methods of Operation.—It is rarely possible to remove a cancer of the penis by an operation of less magnitude than amputation, partial or complete, of the organ. Even in those cases in which the disease commences in the prepuce, it is seldom situated so far forward or diagnosed so early that circumcision suffices for its complete removal. When, happily, this is the case, there is every reason why this operation should be preferred to the mutilation produced by amputation.

For practical purposes, it will be convenient to separate the

partial amputations, which consist of removal of the projecting portion of the penis, from the complete amputations or extirpations, which may include not only the entire penis, but as much as is deemed necessary of the adjacent structures. The instruments which are employed, and the manner of operating, depend largely on the extent of the operation.

Partial amputation.—Although various methods of cutting through the penis are described, such as amputation with the écraseur, amputation with the actual cautery, &c., only one method is commonly practised at the present time in this country: the removal of the organ with the knife.

Amputation with the knife.—The patient having been prepared for the operation in the usual manner, and anæsthetic having been administered, the seat of amputation, at least three-quarters of an inch behind the disease, is determined on. The operator seizes the end of the organ, the cancer having been first cleansed and wrapped round with several layers of mercurial gauze, and draws it forwards so as to lengthen out the penis. An assistant is instructed to draw back the integument to prevent the removal of too large a portion. The section is then made with a long bistoury. The corpora cavernosa are cut through from the dorsal aspect, the corpus spongiosum being left till last. This is cut through on a plane anterior to the rest of the penis, so that it projects from the cut section. The vessels are tied with catgut or with silk, the wound is washed with antiseptic solution, and may be dressed, for the operation is completed so far as the removal of the disease is concerned. But there is one thing which requires attention—namely the management of the urethra, both for immediate and future purposes. Some surgeons introduce a catheter, made of gum-elastic or some still softer material, leave it in until the cicatrisation is almost or quite complete, remove it, and advise the patient to maintain the orifice fully dilated by passing an instrument at intervals of a week or ten days. But I believe a far better plan is to draw forward the orifice of the urethra, incise it on the front and dorsal aspects to the depth of the eighth or a quarter of an inch, and fasten its margin to the cut margin of the skin on either side by means of four silk sutures. A catheter may still be introduced for greater cleanliness and comfort in micturition during the first few days after the operation. I have employed this

method, which I believe is due to Erichsen, on many occasions, and have been thoroughly satisfied with the result, which has been so successful that no precautions have been needed to maintain the orifice by means of instruments.

A very good flap amputation may be performed in the manner suggested by Professor Humphry (Holmes, *System of Surgery*, 3rd edition, vol. iii. 586). A flap of skin is cut from the dorsum and sides of the organ, and the dorsal arteries are secured. This flap resembles, in miniature, an anterior cutaneous flap in amputation of the thigh. The knife, a narrow-bladed one, is then inserted at a point on a level with the base of the flap, between the corpora cavernosa and the corpus spongiosum, and then is made to cut forwards, outwards, and downwards, for about three-quarters of an inch. From this smaller posterior flap the urethra is dissected out. The corpora cavernosa are then divided on a level with the base of the two flaps. The hæmorrhage is arrested and the urethra is brought out through an orifice in the face of the flaps, which are united at their edges. The urethra is split as was described in the last paragraph, and fastened to the edges of the orifice in the flap. This method affords, as the author says, an excellently covered stump. But it is useful, not only on account of the greater rapidity with which healing usually takes place, and of the more shapely stump, but on account of the diminished tendency to contract of the circle of skin around the end of the stump in an ordinary amputation, which leads in some instances to contraction of the orifice of the urethra.

A good modification of the operation is that practised in the Heidelberg Klinik, of which Keller has given an account (Bruns's *Beiträge z. klin. Chir.* iv. 233). After cutting through the organ with one stroke of the knife, the two corpora cavernosa are united by deeply-placed transverse sutures of catgut, in such a manner that their cut surfaces coincide and their covering of tunica albuginea looks towards the front. A second vertical row of sutures draws the skin together over the stump. The urethra is then slit up along its under surface, and the mucuous membrane is sutured to the skin. A portion of the septum between the corpora cavernosa may be dissected out, and the cavernous bodies may be thus fixed more closely together, if the operator pleases.

In the last edition, I gave a detailed account of *amputation with the galvano-cautery*, but I have not thought fit to repeat it here, because, so far as I am aware, the galvano-cautery is scarcely ever employed in this country, and appears on the Continent to be seldom used except in the Tübingen Klinik. The chief merit of the cautery is that there is less hæmorrhage at the time of the operation. But it has drawbacks which more than balance its merits. The mortality after the operation appears certainly greater than after the cutting operations. And there is greater probability of contraction of the orifice of the urethra. For these reasons the galvano-cautery cannot be recommended.

In every simple amputation of the penis, whether performed with the knife or galvano-cautery or with any other instrument, the same precautions which are observed in the dressing and after-treatment of larger operation wounds should be rigidly carried out. The patients are often in a very unhealthy condition at the time of the amputation, and the shock and mental depression consequent on removal of this organ are in some instances out of all proportion to its insignificant extent. The dressing of the wound is not easy on account of the variations in size to which the stump is liable, and the difficulty of fastening dressings on it in such a manner that they shall be maintained in position at all times of the day and night. The dressings, too, are liable to be frequently wetted by the passage of urine. I have tried several different forms of dressing with indifferent success, and have at length come to the conclusion that the most satisfactory method of managing the wound is to keep its surface frequently powdered over with iodoform, or, if iodoform alone is too irritating, with mixtures of iodoform and starch, or, better still, iodoform and borax; and to keep a thin strip of soft iodoform gauze at the bottom of the crater-like cavity formed by the folding of the integument around the corpora cavernosa. A cradle must be placed over the body of the patient to sustain the weight of the clothes, and if the weather is cold, a blanket must be laid over the upper part of the body, another blanket over the thighs and legs; and at the same time it may be necessary to cover the stump with a piece of antiseptic gauze and a layer of cotton-wool. The gauze-covering should, if possible, be avoided, however, on account of the manner in which it

tends to adhere to the surface of the wound and renders the application of fresh powder at frequent intervals difficult and painful.

Complete Amputation, or Extirpation.—Of the many methods by which the complete removal of the penis may be effected by the knife, I believe that none is better than that of P. Gould. It is described in the *Lancet* for 1882, i. 821, and provides for the maintenance of the orifice of the urethra and for the removal of the entire length of the corpora cavernosa. The manner of performing it is as follows :—

The patient having been carefully prepared for the operation, anæsthetic is administered. He is then placed in the lithotomy position and the skin of the scrotum is incised along the whole length of the raphé. With the finger and the handle of the scalpel the scrotum is divided into two halves quite down to the corpus spongiosum, which is thoroughly exposed. The separation of the two halves of the scrotum is effected with singularly little hæmorrhage. A full-sized catheter is passed along the urethra as far as the triangular ligament, and a knife is inserted transversely between the corpus spongiosum and the corpora cavernosa; the catheter is withdrawn and the urethra cut across. The deep end of the urethra is detached quite back to the triangular ligament. An incision is then made round the root of the penis continuous with that in the middle line, the suspensory ligament of the penis is exposed and cut through, and the penis is everywhere separated except at the attachment of the crura. Now follows one of the most tedious parts of the operation, the separation of the crura from the pubic bones, which is effected by means of a stout periosteum elevator. The hæmorrhage is usually trivial and the only arteries which require ligature are those of the crura; but the toughness of the tissues of which the crura are composed and their close adherence to the bone render the separation very slow and difficult. When the penis has in this manner been removed, the corpus spongiosum is slit up for about half an inch and the edges of the cut are stitched to the back part of the edges of the incision of the scrotum, so that the orifice of the urethra will in future be almost in the perinæum. The two halves of the scrotum are brought together, a drainage-tube having been placed deep down in the wound with its ends projecting at the front and back. It

is not necessary to introduce a catheter. The dressing employed by Gould is an antiseptic absorbent cotton-wool pad, kept in place by means of a T-bandage.

Gould's method, which resembles in many respects those of Thiersch, Delpech, and Gouley, offers the advantage of an exceedingly good result, so far as the preservation of the urethra is concerned, and of being easily performed. It is, of course, in the manner in which I have described it in the preceding paragraph, suitable only for cases in which the disease is limited to the penis, and has not widely or deeply invaded the adjoining structures. By slight modifications it may be made to suit such cases if it is determined to operate upon them.

Gray (*Trans. Med. and Phys. Soc.* Bombay, 1887) modifies Gould's operation by commencing in the perinæum, separating the urethra, and bringing it out through the wound; finally severing the corpora cavernosa through an oval incision around the base of the penis. In this manner he avoids splitting the scrotum. I have not tried his modification, and cannot therefore speak of it from personal experience.

The removal of the Inguinal Glands should, I now think, be practised in every case in which the patient can be induced to submit to the operation. Horteloup has particularly emphasised the frequency with which the glands are attacked, even when the operation on the penis has been quite successful. In a series of cases which he collected (*Gaz. Hebdom.* 1887), there were nine in which recurrence of the disease took place after amputation of the penis. In one of the nine, the recurrence was in the stump of the penis and in the glands. In two, it was in the stump alone, but in the remaining six patients, the glands became cancerous, although there was no recurrence in the penis. This positive evidence is of more importance than the failure of Butjägin to find actual microscopical cancer in the enlarged and hard inguinal glands which were removed in fifteen cases of cancer of the penis. Although the femoral glands are occasionally the seat of secondary disease, they are not so frequently affected as to render their removal necessary as a part of the routine operation for cancer of the penis.

In the very large majority, if not in all cases, the glands must be removed from both groins, and the dissection may be

long and difficult. Partly on that account, and even more for another reason, I am sure it is expedient to divide the operation into two parts, first removing the cancer of the penis and, at a later date, dissecting out the inguinal glands. If the operation is all performed at one time, it is very difficult, if not impossible, to prevent the groin wounds from being fouled by the cancer of the penis, which is almost invariably ulcerated, and often horribly offensive.

If the glands are seriously involved, adherent to each other and to the surrounding and especially the deeper structures, it may be impossible to remove them without inflicting a mortal injury on the patient. In such cases, the glands in the abdomen are probably already affected, so that an operation can only be regarded as palliative.

The removal of the glands is just as necessary in cases of sarcoma as in cases of carcinoma of the penis, for they appear to be equally liable in both diseases.

Results of Operations.—*Mortality due to the Operation.*—Although it is possible to arrive at a just estimate of the risk to life from the mere operation of amputation of the penis, it is very difficult to judge how far the larger operations, and the removal of the groin glands, are likely to affect the mortality.

In the statistics which I used more than ten years ago, the mortality on a large number of cases appeared to be about four per cent., when cutting instruments were employed, and from thirteen to fourteen per cent. when the galvano-cautery was used. Even a four per cent. mortality on such a simple operation as amputation of the penis is very large, and I am glad now to be able to show that the risk of the operation is very much reduced. In a series of fifty-three cases of simple amputation in one hospital during the twelve years from 1886 to 1897, there was only one death, and this represents very fairly the practice of the hospitals during that time. Even a two per cent. mortality on such a small operation would be regarded as large, if it were of another part of the body, in which aseptic or antiseptic surgery could be rigidly carried out. This is, of course, impossible for the penis, but the improvement in the results shows that the measures which are now employed ensure better results. The wound is not deliberately poisoned by imperfectly purified hands, instru-

ments and sponges; and the dressings which are used and the frequency with which they are changed serve to keep the wound very healthy. Death from sepsis has become very rare after amputation of the penis.

It has been stated, particularly by Demarquay, that patients who have suffered amputation of the penis are very liable to melancholia, and this is sometimes fatal. I believe this danger is exaggerated. An attack of mental derangement may occur after any operation, and does not appear to follow amputation of the penis more frequently than other operations. Operations on the eye and on the female generative organs are said to predispose to it particularly.

Although hæmorrhage after amputation of the penis is much talked of in works on surgery, death from hæmorrhage is extremely rare. In fact, I do not know of any cases in which it has occurred. I am therefore disposed to think its importance has been greatly exaggerated. There is often free bleeding at the moment of the amputation, but it is easily checked temporarily, either by the fingers or clamp-forceps; or the base of the penis is tied round with elastic or tape. When the vessels have been tied, the spaces in the corpora cavernosa continue to ooze, and the oozing is difficult to check immediately. But a strip of iodoform gauze on the cut surface diminishes the bleeding, which usually ceases shortly after the patient is returned to bed.

It is quite impossible to procure a sufficient number of cases of any one of the larger operations of extirpation of the penis to give any idea of the mortality. The mere extirpation, as practised by Gould or Thiersch, is not a very dangerous operation, and the mortality is probably not more than six per cent. But when it is complicated by the removal of the scrotum and its contents, or large areas of the surrounding integument, and by the removal of the groin glands, it becomes decidedly more dangerous.

Mere amputation of the penis, with the removal of the glands in the groins, ought not to be much more dangerous to life than simple amputation of the penis, provided the glands are not adherent, and the operation for the removal of the glands is deferred until the patient has recovered from the amputation. There is, of course, a possibility that the groin wounds may be fouled by the soaking of urine into the dress-

ings, especially in the cases of ignorant and dirty patients. But, frequent changing of the dressings in such cases will generally suffice to keep the wounds aseptic. And, even if fouling of the wounds takes place, it seldom results in more than a modified and passing suppuration.

Cures effected by Operation.—The later history of cases of cancer of the penis has not been followed up closely in a very large number of cases; and I propose, as soon as I can arrange for assistance, to search out the further history of all the patients who have been treated in St. Bartholomew's Hospital, as I have already done for cancer of the breast, the scrotum, and other parts. In the meantime, I have at my disposal the records of sixty-five patients for the full period of three years, in addition to an account of sixteen patients who were alive and free from recurrence during various periods of from a few months to between two and three years. Of the sixty-five patients, twenty-three had passed successfully the three-years limit, and may be regarded as cured, so that the proportion of successful cases was more than thirty-five per cent. The operation in almost all the successful cases consisted in amputation of the penis, not in extirpation, and the disease was situated at or near the extremity; I do not know in how many of them the lymphatic glands were removed.

I believe the next ten years will furnish much better statistics; for it seems quite clear from these results that cancer of the penis, of whatever variety, is not by any means a very malignant disease. It originates so frequently at or near the extremity of the organ, and infiltrates its substance so slowly, that mere amputation is generally successful in averting recurrence *in situ*. I have been surprised at the certainty with which it does so in the observation of two of my own patients, whom I have seen from time to time for other maladies during the last few years. Each patient was suffering from epithelioma, in the one case limited to the glans, in the other case extending from the glans into the corpora cavernosa, which were infiltrated for some distance, but the limit of the disease was very well marked. Amputation an inch behind the disease has sufficed to protect both patients from recurrence for six to ten years. Some of the successful cases in the above lists (which do not include these two cases) had been watched for nearly twenty years. The smaller mortality from

the operation and the care which surgeons exercise to get well behind the disease render it almost certain that better results will be secured. And, if the glands in both groins are removed in every case, it is quite sure, from the reports of cases in which the glands have become affected after successful amputation of the penis, that more cured cases will be obtained. And, if we can only persuade patients and their attendants that early operation is likely to be permanently successful, the percentage of cures will become much larger. Of course, there is always the difficulty of an early diagnosis. But, as the disease is ulcerated in the very large majority of cases, its nature can be readily proved by cutting off a portion of the border of the ulcer and submitting it to microscopical examination. In every case in which there is the least doubt this practice should be adopted.

Are patients who are not cured benefited by operation?—With this question must be associated that of the *condition* of persons who have been cured by operation, for the removal of the penis is a very different matter from the removal of the breast or a portion of the lower lip. In the first place, there is the question of the power of micturition. The evidence on this matter is very conflicting, but there can be no doubt that some patients suffer considerable difficulty in passing water, while other patients are not in the least degree inconvenienced by the removal of the penis. A great deal is said of the necessity of cutting through the corpus spongiosum (and therefore the urethra) in front of the level at which the corpora cavernosa are divided. From my own experience I should say this is not essential. I have removed the penis at various points in front of the level of the pubes. In one or two cases I have made the incision oblique from behind forwards, and from above downwards. But in every instance after the amputation I have split the orifice of the urethra for a short distance, and have fastened the edges of the split urethra to the integument. I have had the opportunity of observing some of these patients for some years after the operation, and have been pleased to find that there has not been the least difficulty in micturition. In those cases in which the penis has been extirpated and the urethra has been turned down into the perinæum, I cannot find that there has been any difficulty in micturition, for the only complaint has

been that the patients are obliged to sit in order to pass water.

It appears much more likely that difficulty of micturition would result from operations conducted by means of burning instruments, when there are not the same facilities for dealing with the orifice of the urethra; indeed, the reports tell that some of these patients experience difficulty, and are obliged to maintain the opening of sufficient size by the use of instruments.

The second question is the power of begetting, a matter of very secondary importance when compared with that of micturition. On this question there is not very much evidence at hand, but there is enough to show that amputation of the penis at the junction of the middle and distal third, or at the middle, does not necessarily destroy the power of coitus and begetting. Of course, amputation at the pubes or the extirpation of the organ acts as a complete preventive; and the question has been raised, with regard to the latter operation, whether it would not be better to remove the testes when the scrotum is split down the middle in order to relieve the patient of organs which are not only useless to him in future, but may cause him very great discomfort. It seems scarcely right to subject patients to so severe an extension of the operation for such a purpose, and I doubt that the feeling of most surgeons will be in favour of such a proceeding.

So far as the benefit of patients who are not cured by operation is concerned, I am quite certain that many of them derive the greatest advantage from the removal of the disease; particularly those persons in whom the disease is so situated that amputation of the organ can be performed in front of the pubes with almost absolute certainty of preventing recurrence in the stump of the penis. Some of these patients are already suffering from such extensive affection of the groin glands that it is hopeless to attempt to remove them; but the operation frees them from the encumbrance of a mass of disease which is often very foul, is sometimes exceedingly painful and very tender, and which may be the cause of great distress in micturition. Two cases in my own practice offer examples of the benefit derived from operation by patients who could not be claimed as cured One of these was an old man with extensive disease, which necessitated amputation quite up to

the pubes. While the wound was healing, recurrence appeared in the midst of the granulations, and the recurrent button was removed. He recovered and returned to his work. At the end of many months—nearly a year—I operated for the removal of a small mass of enlarged glands in the left groin ; but there was no recurrence in the stump, and he had been in good health and the enjoyment of great comfort ever since the removal of his penis. The second patient was a comparatively young man, not more than thirty years of age, whose penis I amputated, and from whose right groin at the same time I removed a large number of hard glands. The dissection was difficult and passed beneath the femoral vessels. He slowly recovered and returned to his employment. At the end of from two years to two years and a half he came back with recurrence of the disease in the right groin and with enlargement of the glands in the left groin. The enlargement had very slowly taken place, but had evidently been taking place during a long period ; but there was not any recurrence in the stump of the amputated penis. These two are only some of many instances which could be adduced to prove the advantage of such palliative operations. The first was, of course, not performed as a palliative operation in the first instance, but it is probable it will prove to be only palliative from what is known of its later history.

I believe that *extirpation* of the penis may also be performed in some instances with great advantage, merely for palliative purposes.

Conclusions.—Amputation of the penis, performed for cancers limited to the end of the organ, when there is no glandular or other complication, may be performed with a good prospect of success.

The amputation should be made with the knife, and the mortality is small ; and if the edges of the urethra are united to the edges of the integument, there is little fear of subsequent difficulty in micturition.

The amputation should be performed at least three-quarters of an inch behind the disease.

The prognosis is very bad when there is already affection of the groin glands, or if the glands become affected after the removal of the penis.

Glands which are affected should be removed, if they are within reach of removal.

Even if there is no enlargement of the glands, they should be removed as a precautionary measure. As the glands on both sides are liable to be affected, both sides should be dealt with. Operations for the removal of the glands should, if possible, be deferred until the wound of the amputation of the penis is healed.

At present there is not sufficient evidence to justify the routine removal of the *femoral* glands as a precautionary measure.

Extirpation of the penis may be performed for extensive disease affecting the body of the organ without a large mortality from the operation ; but the prognosis, so far as cure of the disease is concerned, is not so good as that of mere amputation of the penis for disease situated at or near the extremity.

Palliative amputation, and probably extirpation, may be performed with advantage in many instances in which the situation or extent of glandular or other disease renders an attempt at complete cure hopeless.

CHAPTER XXVI

SCROTUM

It is very unusual to meet with any other variety of malignant disease of the scrotum than squamous-celled carcinoma. And this disease occurs so much more frequently in chimney-sweeps than in men engaged in any other employment, that it is often called "chimney-sweeps' cancer." Next to the sweeps, those men who are daily brought into contact with brown-coal tar, and with crude paraffin, are liable to epithelioma of the scrotum. The disease is, on this and some other accounts, peculiarly interesting, and has more than once engaged my attention. The belief in the disappearance of chimney-sweeps' cancer from this country, which I have shown to be erroneous; the immunity from the disease of the chimney-sweeps of other countries; the various pathological problems which occur in connection with the primary and secondary disease, combine to render the study of chimney-sweeps' cancer one of the most engrossing; and I would refer those who wish to pursue it to three lectures which I delivered at the College of Surgeons in 1892, and which are published in the *British Medical Journal* in June and July 1892.

The cancer may commence on any part of the scrotum, but affects generally the lower and front part; it occurs in men, and is rarely seen before the thirtieth year has been passed; and its occurrence is usually preceded by the formation of one or more warts on the scrotum. The scrotum may, indeed, be covered thickly with these flattened warts, which are well-recognised pre-cancerous conditions. Such a wart may break down shortly after its first appearance, and become cancerous; or the scrotum may have been the seat of warts for many years before one or more of the innocent warts develops into cancer. The manner in which one of these warts becomes cancerous is usually by extending, ulcerating, and becoming

indurated at its base. The process is sometimes rapid, but more often slow; if left to itself, the disease may extend over a large part of the scrotum, infiltrate the whole thickness of the scrotum, produce adhesion of the tunica vaginalis and the testicle, and ulceration of the testicle. Or it may affect the root of the penis and destroy the organ in large part. From the scrotum it may reach the perinæum, the inside of the thighs, the skin of the abdomen. But before or without attacking these parts, it may affect the inguinal lymphatic glands, and these may in the course of time break down, like the primary disease, and form large and deep foul ulcers. From the inguinal the epithelioma may extend to the glands within the pelvis and abdomen. The patients at length perish from exhaustion.

There appears to be very little tendency to the production of secondary affection of the internal organs or distant parts of the body.

It is not easy to estimate the natural duration of soot-cancer, for the primary disease is removed in very many instances. But there can be no question that it may be very protracted, and may last over several years, although many of the subjects of it are carried off in far less time than this.

Methods of Operation.—Small epitheliomata of the scrotum are usually cut out by making an elliptical incision which shall include the disease and the parts immediately around it, care being taken to remove a sufficient area of apparently healthy tissue. The incision should penetrate the whole thickness of the scrotum. After the arrest of hæmorrhage and the thorough cleansing of the wound, its edges may be brought together by sutures. There is not the slightest difficulty in accomplishing this, even when a large fragment of the scrotum has been removed, on account of the elasticity and capacity for stretching which the integuments possess.

It is not possible to describe with advantage the operations which are practised for the removal of those much more extensive examples of the disease which implicate the deeper parts, for the operation depends directly on the extent and situation of the disease and on the organs and tissues which are affected. Operations are described in which the entire scrotum, the testes, penis, and a portion of the skin of the perinæum, as well as of the inside of the thighs, have been

removed, and other operations where, in addition to the removal of extensive epithelioma of the scrotum, the glands in one or both groins have also been dissected out. It is obvious that no set operation will meet such cases as these, and that the operator must decide for himself what he will remove and how he will proceed to do it.

On the night previous to the operation the hair should be shaved off from the scrotum and pubes, and the integument should be prepared as directed in the chapters on the testis and breast. After the operation, the dressings should be of the same material and should be applied as directed in the chapter on the testis. Profuse oozing, which sometimes occurs after incisions in the scrotum, is much less probable when the part is thus dressed.

Results of Operations.—*Mortality due to the Operation.*—Cancer of the scrotum is generally removed when it is still of small size, and the operation is consequently trivial. The cases of extensive ulceration, involving the scrotum, testes, perinæum, and neighbouring parts, which surgeons were called upon to treat in the first half of this century, are now very rarely seen. The introduction of anæsthetics, and the trivial distress which follows on the removal of a small cancer, encourage the men to apply to the hospital while the disease is still of small extent.

Of fifty-eight patients who were operated on at St. Bartholomew's Hospital in the course of many years, I find that only two died of the results of the operation. In both cases, death occurred, not from the severity of the operation, but from the unhealthy condition or age of the patient. One man, thirty-five years old, was suffering from dilatation and hypertrophy of the right side of the heart and from cystitis, and died twelve days after the operation of an ordinary pneumonia. The other patient was seventy-nine years old, and sank slowly from exhaustion within two days of the removal of a small epithelioma. All the larger operations were recovered from, and they included the removal of a large part or the whole of the scrotum, of one or both testes, which the disease had exposed, or to which it had become adherent, and of the glands in the groin. In one instance, in which the operation was performed many years ago, a severe attack of erysipelas, such as was by no means uncommon in those days, carried off

all the integument of the scrotum; perhaps not so bad an accident for the patient as he might have been at first disposed to regard it, for he recovered, and was perfectly well and free from recurrence many years after his recovery.

Cures effected by Operation —At the time of the publication of the first edition of this book, although there was an impression that operations for the removal of cancer of the scrotum were by no means unsuccessful, there was little in the way of actual fact on which the opinion was founded. In the year 1889 I determined to do something to fill up the gap in our knowledge, and searched out the further history of twenty-four of thirty-eight patients on whom operations had been practised in St. Bartholomew's Hospital. I had hoped to have discovered the sequel of a larger proportion of the patients, but, as some of the operations dated nearly twenty years back, and I attempted to perform the work single-handed, I was obliged to content myself with the comparatively small number of twenty-four patients. In table, the results are the following:

Died of operation	2
Dead or alive with recurrence	9
Died of other cause within three years . . .	1
Died of other cause than cancer after three years .	2
Alive and well within three years	4
Alive and well after three years	6
Total	24

The number of patients who were alive and well more than three years after the last operation, or who had died of some other disease than cancer after three years, is therefore eight; and this number, compared with a total of twenty-four patients, gives a remarkably good percentage of successful cases. The longest periods of immunity of which I could obtain information were, six years (two cases), eight years, nine years, and ten years.

Among the successful cases was one man, who, five years before I saw and examined him, had typical cancerous glands removed from both groins. He was in perfect health. Another patient, who had nearly passed the three-years' limit, had also had the groin glands removed from both sides.

It will not improbably be objected by some surgeons that

three years is not a sufficiently long limit in the case of cancer of the scrotum, for there are cases on record in which the disease recurred much more than three years after the primary disease had been removed. In a disease so rare as cancer of the scrotum, two or three such cases are of much importance. I am quite willing to admit the justice of this objection, although it is almost certain that, in some of the cases, the so-called recurrent disease was really a fresh outbreak in another, although perhaps nearly neighbouring, part of the scrotum. The examination of the scrotum of men who have been long employed as chimney-sweeps in this country almost invariably discovers numerous dark or black patches and small warts in the integument of the scrotum, precisely similar to those from which the primary disease originated. In fact, many parts of the scrotum in these men are prepared for the occurrence of cancer, and there is no necessity to have recourse to the theory of recurrence to account for outbreaks of the disease at intervals of years.

Sir James Paget removed a warty cancer from the scrotum of a chimney-sweep about the year 1855, and regarded it as typical cancer. Twenty years later, in 1876, Mr. Howard Marsh removed two or three indurated lumps from the neighbourhood of the scar. Mr. Willett cut out in 1880 a cancerous ulcer which had penetrated so deeply that the testicle was exposed in the operation. Nine years later, I found and examined the old man in the Mile End Town Infirmary, where Dr. A. H. Robinson kindly showed him to me. He was in perfect health, so far as his scrotum was concerned.

Even when the disease appears to be undoubtedly recurrent, it runs a comparatively mild course. J. S., a chimney-sweep, had a small warty growth cut out of the scrotum in 1880. In 1882 a larger growth was removed from the same place, In 1883 another growth appeared in the scar, and was removed. The glands in the left groin were at that time enlarged, but they were not removed. In 1887 a fourth operation for recurrence was performed: the groin glands were much in the same condition as on the previous occasion. In October 1889 I saw this man, nearly two and a half years after the last operation. He looked very well and declared that he was quite free from the disease, but he would not allow me to examine him, so I cannot speak with certainty of his state.

The table of results is even better than it reads, for there really were not nine patients in whom the disease recurred. In two or three of them—I am not quite sure whether two or three—the operation was merely palliative, performed for the removal of foul malignant disease of the scrotum on patients who were suffering from fixed cancerous glands. They died from the continuance, not from the recurrence, of the disease.

Such cases as these afford an answer to the question *whether patients who are not cured are benefited by operations.* If only a part of the disgusting disease is successfully removed, that is so much gain to the patient.

Conclusions.—From what I have seen of cancer of the scrotum, I believe the following conclusions are thoroughly justified:

The prospect afforded by removal of uncomplicated cancer of the scrotum is very hopeful. The operation should be as early and as free as possible, and the cancer should be made the centre of the wound. There need be the less hesitation in very free treatment of cancer in this situation on account of the superabundant skin, the ease with which operations are recovered from, and the completeness with which the wounds heal.

Adherence of the primary disease to the testis and other parts renders the prognosis less hopeful, but does not contra-indicate an operation.

Cancerous affection of the glands need not deter the operator from removing the primary disease and the glands with it, if they are within the reach of an operation. Even if the glands on both sides are cancerous, they may be removed with some hope of success, provided they are movable.

Operations for recurrent disease may be undertaken with a far better prospect of success than is usually offered by such operations.

CHAPTER XXVII

TESTIS

Both sarcoma and carcinoma attack the testicle, but cases of sarcoma are more numerous than cases of carcinoma. Although there are differences between the two diseases, especially in regard to the age at which they may occur and the mixture of other tissues with the naturally soft structure of the sarcoma, these differences are not so considerable that they need be taken into account in the question of operation. It may, however, be mentioned that although both diseases are usually found in persons over thirty-five or forty years of age, yet sarcoma is not uncommon in boys under ten years old; and that cartilage, which is frequently mingled with the tissues forming sarcoma, is rarely found in carcinoma. Further, affection of both testes has only been known to occur in cases of round-celled sarcoma.

Malignant disease of the testis, then, may occur in children and in adults, but seldom occurs in children after ten years, and rarely in adults under thirty years of age. It usually affects only one testis, but occasionally attacks both, either simultaneously or after a more or less prolonged interval. The tumour appears to attack the entire body of the organ and produces general enlargement, which takes place almost always continuously, though the rate of progress may differ much in different instances. So may the size attained by the tumour, for sometimes death has occurred from generalisation of the disease while yet the primary growth is comparatively small; in other instances the primary tumour has attained a very large size, and many pounds in weight. The enlarged testis may become adherent to the scrotum, and ulceration may ensue with the production of fungus testis; but this is a rare event. In some cases the disease spreads up the cord to the pelvic and abdominal glands, and the thickened cord can be

plainly distinguished passing up through the internal ring. But the glands may be affected without any very marked enlargement of the spermatic cord; or perhaps it would be more correct to say that the cord, though slightly enlarged, need not contain any actual disease, but may be practically healthy at the time of the removal of the testis, and may remain healthy, while the glands may slowly enlarge and form huge masses of cancer in the pelvis and abdomen.

Generalisation may take place in the lungs, the liver, and other organs; the round-celled sarcomas especially are associated with secondary growths in many parts of the body.

The duration of the disease is liable to great variation; its natural duration is of course affected by the operation of castration, for very few cases are allowed to run their course without operation. Some of the patients have been destroyed by the disease in the course of a very few months; others have been operated on after the tumour of the testis has been observed for two or three years, and have lived for several years after the operation. The operation of castration may be successful in preventing recurrence of the disease in the cord or scrotum, although it may not be performed in time to save the life of the sufferer, who may die of secondary affection of the lymphatic glands and other organs.

It must not be forgotten that retained testes are quite as liable, if not more liable, to malignant disease than naturally placed testes.

Methods of Operation.—The operation of castration, or excision of the testis, is practised at the present time almost solely by the knife, the galvano-cautery having fallen into disuse for this and similar operations. Ligature of the spermatic cord, which at one time enjoyed some reputation as a means of arresting the progress of malignant disease of the testicle, I have not heard of for some years.

The integument of the scrotum must be prepared on the night before the operation with extreme care, in the manner described in the chapter on the Breast. The condition of the skin and the surrounding parts makes it very difficult to ensure as perfect asepsis here as in many other parts of the body; but, in spite of that, the cases do well, and few of the wounds suppurate. It need scarcely be said that the hair of both sides of the pubes and scrotum should be carefully removed before

the further preparation of the skin is commenced. (The presence of a hernia on the affected side should be ascertained, if possible; for although it does not contra-indicate operation, greater care is requisite in dealing with the cord in order to avoid opening the hernial sac. If the sac is opened, the contents may be returned, and the sac ligatured high up and removed below the ligature.) The patient is placed under the influence of an anæsthetic, the thighs are abducted and everted, and a sponge is placed in the perinæum. An incision is made from just below the external abdominal ring down to the lowest part of the scrotum, which is tensed by drawing it tightly over the tumour. The integuments are divided down to the tumour, which is exposed in the first cut, and is dissected out without difficulty. The spermatic cord is also dissected out as high up as is deemed necessary. At the highest point it is grasped by the fingers of an assistant, or, better still, with two pairs of clamp-forceps. It is then cut through, and the vessels are tied separately. When the hæmorrhage has been arrested, the clamp-forceps are taken off and the stump is allowed to recede. If the vessels in the scrotum have not been ligatured before the removal of the testis, they must now be tied. The wound is then thoroughly cleansed with antiseptic solution, the edges of the incision are brought together with silk or catgut sutures, and a small drainage tube is inserted at the lowest part of the scrotum. A little iodoform is sprinkled over the skin, and long strips of iodoform gauze are wound round the scrotum and the remaining testis and root of the penis so as to keep the parts raised, and to maintain sufficient pressure to prevent much oozing of blood. Over this dressing mercurial gauze and boracic wool are placed, and last of all a small triangular sheet of waterproof jaconet, lined with a layer of the same cotton wool. A hole is made towards the base of the triangle, and the penis is drawn through the hole. Strips of bandage are fixed to the three angles of the triangle, the apex of which is placed in the perinæum, and the bandages are tied together in such a manner as to draw the dressing tight up against the scrotum. The tube is taken out two days after the operation, and the wound is not again disturbed for another week, when the stitches are removed, and the healing is generally complete.

Skin which is adherent to the tumour must be removed

freely. The prognosis in such cases is much worse than in those in which the skin is natural; for, in addition to the increased danger of local recurrence, there is great probability of affection of the inguinal glands as well as those in the pelvis and abdomen.

If the cord is obviously affected up to and beyond the external ring, it may be followed as far as or beyond the internal ring, if it is thought desirable to operate under such circumstances, when the lymphatic glands are almost certain to be affected, and there is little prospect of averting a recurrence *in sitû*.

A cancerous retained testis may be removed with the same hope of curing the patient of the disease as if the testis were situated in the scrotum, but much greater care is needed in deciding whether it is expedient to perform an operation or not. It is not easy to determine in all cases whether the tumour is free from the surrounding tissues, and the condition of the cord may be a matter of the greatest uncertainty. The operation is conducted much in the same manner as when the testis is removed from the scrotum, except that a longitudinal incision is made in the long axis of the tumour, and greater care is needed in the dissection. The cord and its vessels are dealt with in the manner which has been described.

In order to remove the cord at a much higher point than is done in the operation I have just described, Büngner recommended that traction should be put upon the vas deferens until it gives way. Lauenstein carried this suggestion out in thirteen patients, who were suffering from various affections of the testicle, but the results were not encouraging. More than a foot in length of the vas was drawn out in two cases of sarcoma. But in three of the thirteen cases there was very troublesome internal hæmorrhage, and one of the patients died of suppuration of the kidney.

Coplin Stinson, commenting upon my statistics in the *New York Medical Record* for 1897, thinks that a radical operation will afford more encouraging results, and suggests that the following structures should be removed: the diseased testicle and its coverings; the portion of the scrotum containing the diseased organ, including the raphé and the septum scroti; the spermatic cord and its vessels as high up as the internal ring; the inguinal glands, fat, adhesions, &c. I am afraid that this

operation would not do much to improve the surgery of malignant disease of the testicle, for it is not adapted to the course and conditions of the disease. In cases in which the tumour is not adherent to the scrotum, there is practically no fear of recurrence in the integument, and even the spermatic cord is rarely the seat of recurrence unless it is obviously thickened and indurated at the time of the operation. The inguinal glands are never affected, so far as I am aware, unless the skin of the scrotum is involved.

On the other hand, the glands within the abdomen are so liable to be affected that a large number of the patients from whom the testis has been successfully removed succumb to disease of the glands, and secondary tumours in other organs and tissues. The surgery of the immediate future must be directed to the removal of these lymphatic glands, whether they are diseased or not. If they are cancerous, probably very little advantage will be gained by the operation ; but, if they are not yet cancerous, the removal of the testis, the entire spermatic cord, and the glands along the course of the main vessels on the brim of the pelvis may help to avert a later fatal affection of the glands in a certain percentage of the cases. Thus far, we are scarcely in a position to design a routine operation for this purpose, on account of the lack of information which still exists of the exact course of the disease. Owing to the fact that few, if any, such operations have yet been performed, that very few patients die of the ordinary operation for castration, and that, when they die at a later period of internal disease, there is usually so much and such widely spread disease of the abdomen, the opportunities for the study of the course of the disease are singularly few. I trust that this defect in our knowledge may be speedily filled in.

Results of Operations.—*Mortality of the Operation.*—Castration, such as I have described it, is not by any means a dangerous operation to life. It has been performed 112 times at St. Bartholomew's Hospital during the last ten years for various diseases, and in males of all ages, and only one person appears to have actually died from the result of the operation, a man who was suffering also from enlarged prostate, and who died in the course of forty-eight hours of collapse. In thirty-three of the cases the disease was malignant, and two of these

patients died shortly after the operation, both, apparently, from extensive metastasis of the disease. In one, the affected testis was retained, and the patient did not survive the operation many days; in the other, death did not take place till two months after the removal of the testis.

In ordinary cases, hæmorrhage and sepsis are the chief dangers to be apprehended; but hæmorrhage so seldom occurs after the separate ligature of the vessels of the cord, that it is more an imaginary than a real danger. Sepsis might be expected to be of more frequent occurrence on account of the difficulty in perfectly preparing the integument of the scrotum. Probably it would be more frequent if the disease frequently ulcerated through the scrotum, and produced a malignant fungus testis. But this is rare, and the preparation of the skin of the scrotum is, in spite of difficulty, generally so successful that sepsis is as rare as hæmorrhage.

I cannot yet predict the effect on the mortality of an attempt to remove the lymphatic glands along the course of the large vessels. It must certainly increase it. And, if it appears likely to do so to any large extent, the question will arise whether the testis and a part of the cord should be removed as a preliminary operation, and the remains of the cord and lymphatic glands at a later period.

Cures due to Operation.—I am sorry that I have little to add to the information of the last edition under this heading. I do not know why malignant disease of the testis has not excited sufficient attention in any of the great clinics at home or abroad to encourage a search into the later results of operations. I can only add to the ninety-nine cases which I had collected, from various sources, at that time nineteen cases contained in Stenger's Inauguration Dissertation (1889), making a total of 118 cases of castration for sarcoma and carcinoma. The results may be tabulated as follows:

Died of the operation	4
Dead or alive with metastasis	43
Lost sight of	52
Well less than three years after operation . . .	13
Well more than three years after operation . . .	6
Total	118

The proportion of successful cases is therefore nearly twelve

per cent., arrived at by deducting the patients who were lost sight of after the operation or in whom the operation had been performed within three years from the total 118 cases. The totals are then six cured out of fifty-three persons treated. The results are not very encouraging, but I make little doubt they would be somewhat better if the patients had been thoroughly searched out. My personal experience of castration for malignant disease is singularly small, in hospital and private practice; for one reason, that the disease is really rare. My hospital has furnished scarcely more than three cases a year for the last ten years, and those cases are distributed by hazard among the five surgeons and five assistant-surgeons, so that, if each one received his due share, he would see but few cases in ten years. However that may be, I have not had sufficient experience of the later course of the disease, whether sarcoma or carcinoma, to be able to form a just idea of their malignity. So far as can be judged from the scanty material at our disposal, there is no difference in the malignancy of the two diseases.

A study of the scanty material at our disposal is, nevertheless, well worth the trouble. We learn from it that the disease seldom recurs *in situ* either in the scrotum or the spermatic cord, unless the tumour was adherent to the scrotum at the time of the operation, or the cord was obviously thickened. We may go even farther than this, and find that there were several cases in which the tumour was already adherent to the scrotum, or the cord was noticed to be thickened, but free removal was not followed by recurrence of the disease in either place.

Again; recurrence *in situ* or metastasis, or both, usually occurred within a short period of the operation, so that a lapse of two or three years without any appearance of the disease may be regarded as very hopeful. Certainly, more than twenty-three of the patients who died of recurrence or metastasis did so within a year of the operation. But, a full period of three years must elapse before the patient can be regarded with confidence. A perusal of some of the cases and one case in my own experience have impressed this strongly on my mind. I removed a cancerous testis of several months' duration, and as large as a small cocoanut, from a lieutenant in the navy. He recovered readily from the operation, and, in

the course of a short time, returned to his duties at sea. In the course of a year or more he became a commander, and enjoyed health which might be called robust. About two years and a half after the operation he was suddenly seized, while on board ship, with severe pain in the abdomen, which never completely left him during the three or four months of the remainder of his life, and which was the first symptom he had ever noticed of malignant disease which developed all over the interior of the abdomen.

As in the case of malignant disease in many other parts of the body, the estimated duration of the disease before operation varied within the widest limits. In some instances, the testicles had only been known to be enlarged for about a month, and in other cases several years had elapsed, but the disease had for a long time advanced so slowly that the patient had not sought advice, or cared to accept it when it was in favour of removal of the testis. The slow-growing tumours afforded, as might be expected, some of the most successful cases.

The prognosis after operation is particularly bad in children, and in cases in which both testes are affected, whether simultaneously or one after the other. I do not know of any instance in which the operation has been permanently successful in children, but I am not prepared to say that there are none such.

Are patients who are not cured relieved by operation?—To this question a very decided answer in the affirmative may be given. Not for every case, perhaps, but certainly for the large majority of instances in which the operation has been performed before there is evidence of advanced disease. In more than twenty of the cases which proved fatal (after the operation but from causes unconnected with it) there was not any recurrence of the disease *in situ*, and the very large majority of these patients died of the effects of an abdominal tumour, for the most part glandular. It cannot, of course, be maintained that death from this cause is free from pain or distress, but it is quite certain that the presence of a large and heavy tumour in the scrotum would have added much to the sufferings of the patients, and their distress would have been infinitely greater had the testis sloughed or ulcerated. Malignant tumours of the testis sometimes attain an enormous

size, and become extremely irksome by their size and weight. The removal of such an encumbrance affords marvellous relief; and, as the relief is purchased at a very small risk to life, and with very little pain or inconvenience, there is, in addition to the prospect of a permanent cure, a great inducement to a man to undergo the operation. In those cases in which the cord appears not to be at all enlarged, and there is no adhesion of the tumour to the scrotum, a very fair promise may be given that the disease will not recur *in sitû*.

Conclusions.—Castration for malignant disease is an operation which may be performed with very small danger to life.

The operation, whether for sarcoma* or carcinoma, cannot be

* While the foregoing sheets were in the press, my attention was called to a very good paper on Sarcoma of the Testicle by Dr. G. M. Kober in the May number of the *American Journal of the Medical Sciences* of this year (1899), page 535. It contains a table of 108 cases collected from German and English literature reported during the last eighteen years. Probably some of the cases are the same as those which are contained in my collection. Whether or not, it is very interesting to analyse and compare the results of the two tables. I have analysed Kober's table for myself, in order to place the results under similar headings to those I employed in this chapter. Two of the 108 cases are omitted, because twenty-nine and thirty refer to the same patient, and 104 was not submitted to a radical operation.

Died of the operation	5
Dead or alive with recurrence or metastasis . . .	30
Died shortly of other cause	3
Lost sight of within a year	53
Well less than three years after operation . . .	6
Well more than three years after operation . . .	9
Total	106

The results, so far as cured cases are concerned, are better than those of my table. This appears due to the care which has been taken to search out the further history of the cases recorded by Keil (Halle) and Stenger (Berlin). Keil is responsible for twenty-one cases from Halle, and Stenger for eleven from the *König. Klin. zu Berlin.* Almost all the cases have been traced out, and the results are the best furnished. They include six cases of success (from three to ten or more years) after the operation; and, curiously, the proportion of successes is almost the same in each Klinik, four on twenty-one cases and two on eleven cases. In addition, several of the patients were alive and well between one and three years after the operation. Three patients out of the 106 are set down as having died of some other cause than recurrence or metastasis; but I am afraid there is some reason to believe that all three died of metastasis of the disease.

said to be attended with large success, so far as complete cure of the patient is concerned, but there is a great lack of information on this subject.

There is, however, evidence to show that it *may* be attended with permanent success, and there is still further evidence to show that the operation may be an excellent palliative measure, even if it fails in its primary object—cure.

There is comparatively little fear of recurrence *in sitû* unless the cord is thickened or the scrotum adherent at the time of the castration.

There is no prospect of permanent success for operations for recurrent disease unless the recurrence is seated in the scrotum.

Castration may be performed for malignant disease of both testes, if not with a reasonable prospect of permanent, yet certainly of temporary, relief.

The attention of pathologists and surgeons must now be directed to the extension of the disease to the lymphatic glands, with the hope of devising an operation which may help to avert the occurrence of glandular affection and dissemination after the removal of the testis.

CHAPTER XXVIII

VULVA

A FEW cases of sarcoma of the vulva have been recorded, and some years ago Haeckel (*Archiv f. Gynäkol.* xxxii. p. 400, 1888) put together the reports of ten cases of melanotic sarcoma which had been published in various medical works. The disease appeared to affect precisely the similar parts of the vulva to carcinoma, and to run the same clinical course, producing disease of the lymphatic glands.

Carcinoma of the vulva, although not rare, is nevertheless not a common disease. Gönner's statistics, taken from the Basle gynæcological clinic in the course of several years, showed that only five cases had been observed among 900 cases of female disease, which included 100 cases of malignant disease of the female organs of generation. The variety of carcinoma is almost always the squamous-celled or epithelial. Any part of the vulva may be the primary seat of the disease, but the large labium is the seat of predilection. Sometimes the sore or wart is situated between the large and small labia, and thence spreads to both. The form in which it first appears in many instances is that of a tubercle or a collection of warts or tubercles. These may be very irritable, and the patient is obliged to scratch them frequently, and this may increase the liability to cancerous metamorphosis of a condition not yet truly malignant. Schwarz has described a case in which epithelioma developed from leucoplakia. I have seen a similar case. The patient was an unmarried lady, about thirty-six years old. Almost all the surface of the vulva was the seat of precisely similar leucoma to that which attacks the tongue and lower lip. On the inner aspect of the larger labium was a small indurated epithelial ulcer. Ulceration occurs usually at an early period, and the ulcer may be either deep and crater-like, or may be flat and tubercular or warty.

The disease may, indeed, be raised above the surface of the surrounding part of the vulva, and the ulceration may be quite superficial. The base is, however, indurated, and the disease extends from one part of the vulva to another until a large area may be involved. Singularly, it does not appear to tend to spread towards the interior of the vagina, although I have seen cases in which it had done so. On the other hand, it may extend on to the skin of the thigh or groin. The inguinal lymphatic glands are affected as the growth advances, and the glandular affection may be present on both sides. As of the primary disease, so of the glands, ulceration may take place; and, as the effect of the ulceration, the patient may succumb. There are instances on record which show that generalisation of the cancer may take place in many tissues and organs, but these are extremely rare, and the disease is usually limited to the primary growth and secondary affection of the lymphatic glands.

Cancer of the vulva must be regarded as a decidedly malignant disease—far more so than malignant disease of the lower lip, for example, but probably not so malignant as cancer of the tongue. Unfortunately, the situation of the disease prevents women from seeking medical advice at the earliest period; and also, in the case of younger women who suffer from it, may lead to a mistake in the diagnosis between epithelioma and syphilis.

Like the cancers of other parts of the body, cancer of the vulva is a disease of mature age. There is, however, at least one case on record of epithelioma of the vulva in a woman of twenty.

The total duration of the disease, if left to itself, is said to be about two years, but the commencement of the two years is dated by some authors from the time of the first appearance of the disease above the vulva; by others, from the commencement of ulceration.

Methods of Operation.—The easily accessible position of vulvar cancer renders it possible to deal with it by several different methods. It may be destroyed by means of caustics, or may be removed with the galvano-cautery or knife. As in the case of malignant disease of most other parts of the body, however, the tendency of late years has been to employ the knife exclusively: so much so, that I need only describe the

operation with the knife. The only cases in which the galvano-cautery might seem preferable are those in which the disease is of very considerable extent, or in which the patient is too weak to bear the loss of blood consequent on the operation. Even in these cases the knife may generally be quite safely used, provided the vessels are clamped as they are divided, and no attempt is made to perform the removal quickly.

The situation and extent of the disease must determine the manner of operation. It is, of course, extremely difficult to ensure perfect asepsis; but great pains should be taken to do what is possible. The hair should be removed on the night before the operation, the parts thoroughly washed with soap and water, then covered with gauze soaked in the lotion which is usually employed. The vagina should be packed with iodoform gauze, the urine drawn off. On the following morning the dressings should be removed, and the manœuvres repeated. The patient should be fixed in the lithotomy position, with the aid of Clover's crutch. When the cancer is situated in the larger labia, the removal may be made with the greatest freedom and without fear of wounding any important structures; and even when it is situated about the orifice of the vagina or urethra, these canals may be cut into without hesitation. I am not aware of any instance of stricture of the urethra following the operation, however deeply the removal has been carried. The bleeding vessels should be clamped as they are cut through, for the hæmorrhage is often very abundant. If the disease is of small extent, it may be possible to bring the edges of the wound easily together; but, if it is of large extent, an open wound will be left behind. In either case the vulva should be covered with gauze, over which a thick layer of boracic wool is placed, and the whole firmly fixed in place by means of a T-bandage. Before the dressing is applied, a self-retaining catheter should be placed in the bladder, and a long indiarubber tube should be attached to the catheter so as to carry the urine into a vessel outside the bed.

The very important question of the treatment of the lymphatic glands must be raised in every case of malignant disease of the vulva. In cases in which there is obvious enlargement of the groin glands, it has been the custom for many years past to dissect out the affected or apparently affected glands, either at the time of the operation on the vulva or as soon as the patient is

sufficiently recovered to bear a second operation. It is perfectly well known that the primary disease may, in a large number of instances, be removed without recurrence, particularly when it is of small extent and not deeply fixed. It is equally well known that there is a great tendency to affection of the inguinal lymphatic glands and that the disease spreads up from these into the pelvic and abdominal glands. I have on more than one occasion been most distressingly reminded of this liability to glandular affection. The last time was only a few years ago, when I removed from the most prominent part of the left labium of a lady a small epithelioma, which really seemed at the time of the operation to be hardly more than a wart. It hung down from the free margin of a very loose labium, and was not larger than a horse-bean. It was removed with a single snip of the scissors, and the edges of the wound were brought together and united so that no mark of the operation could be discovered a short time afterwards. I must admit I was surprised when the patient was sent to me about fifteen months later with inoperable disease of the lymphatic glands in the inguinal region, the pelvis, and abdomen. This case produced a great impression on me, for it had seemed to be likely to be thoroughly successful. It was quite certain the primary disease could be so removed that there was no fear of recurrence, while the small size and early stage of the growth led me to feel confident that the glands were not yet likely to be affected. I believe, then, the proper course, in every case, is to remove the glands, whether they feel enlarged or not, provided the patient is fit to bear the operation. If the primary disease is not extensive, the glands may be removed at once ; but, if the operation for the primary disease is severe, the removal of the glands may be deferred until the patient is sufficiently recovered to bear it.

When the primary disease is quite on one side of the vulva, only the glands on that side need be removed ; but, if it is at or even near the middle line, the removal of the glands on both sides must be practised.

In order to make the gland-operation as effective as possible, it should be methodically performed. The skin should be turned back, so that Scarpa's triangle is exposed, and the fat and glands should be removed with the same care as is now expended in clearing out the axilla. Rupprecht (*Centralbl.*

f. Gynäkol. 1886, p. 235) recommends the incisions which I think are the best for the purpose. The first is from the anterior superior spine of the ilium to the spine of the pubes. A second incision is made down the line of the great vessels, and the flaps are freely turned back on either side. If the glands above the brim of the pelvis appear to be enlarged, or are hardened, they should also be removed; but the prognosis in such cases is very hopeless. The best cases are those in which the glands are removed before they are obviously affected.

In such operations, the lymphatic vessels between the primary disease and the glands are not removed. But there are obvious disadvantages in carrying the incision up from the vulva into the front of the inguinal region, and there seems every reason to believe that the intervening lymphatics are not liable to be affected in cases of epithelioma as they are in cases of spheroidal-celled carcinoma.

Results of Operations.—*Mortality due to Operation.*—I was surprised to find, in the forty cases which were collected for the first edition, that there was not a single death due to the operation. We have now collected forty-eight more cases, so that the total number amounts to eighty-eight; and not one of the patients died of the effects of the operation. Yet the primary operation in many of them was severe, and in a goodly proportion of them the lymphatic glands were removed; in more than one case from both inguinal regions. Although it would, of course, be absurd to expect an absolute immunity from death from operations for malignant disease of the vulva, it seems, on the other hand, quite clear that, in spite of the severity of many of the operations and of the difficulty of ensuring asepsis, these operations are singularly well borne. An analogy to this comparative immunity, under somewhat similar circumstances, may perhaps be found in the extremely low rate of mortality of operations for the removal of scrotal cancer. In both parts of the body it would be only reasonable to expect some bad cases of sepsis, but, happily, the expectation is so far disappointed that fatal sepsis is almost unknown.

Cures due to Operation.—Although I regard carcinoma of the vulva as a very dangerous disease, I cannot understand why Berry Hart should take so gloomy a view of it as he has expressed in the *Practitioner* (1895, liv. 118). He speaks of it as if it were an absolutely incurable disease, and recom-

mends operation solely as a palliative. The results of the eighty-eight cases which have been collected for this chapter certainly do not justify this view. Tabulated, they are as follows :

Died of the operation	0
Lost sight of after recovery	21
Dead or alive with recurrence or affection of glands .	36
Died of other cause within three years . . .	1
Well from one to three years after operation . .	14
Well more than three years after operation . . .	16
Total	88

The duration of good health in the successful cases was more than three years in seven of them, more than four years in four, more than five years in three; while the duration is not precisely stated in one, and the other is said to have been well "many" years after the operation. In more than one of the cases a second operation had been performed, and the duration dates from the performance of the last operation. And, in several of them, glands which were not merely enlarged and hard, but which were found on microscopical examination to be cancerous, were taken away. A percentage of successful cases of more than twenty-three is very encouraging; and there seems every reason to hope that it may be very much improved in future. For this purpose, two things are necessary—earlier removal of the primary disease, and methodical removal of the inguinal glands whether they are apparently diseased or not. The earlier removal is only likely to be effected when women are better instructed in the danger of the conditions which lead to cancer or are actually cancerous, and when medical men generally take a more hopeful view of the possibility of cure by an early operation. Protective removal of the glands will, I trust, become popular among surgeons as it has already become for many other parts of the body.

Are patients who are not cured benefited by operation?—Undoubtedly, in every case in which there is no recurrence of the disease *in sitû*. The primary disease, as it advances, is a source of pain and the gravest distress. If it can be got rid of so successfully that it does not return in the vulva, even if the patient dies of disease in the groin, abdomen, and pelvis,

the relief afforded by the operation has been almost always very cheaply purchased. Palliative operations may therefore be unhesitatingly performed in cases in which the primary disease is readily and freely removable, and the glands are not operable.

Conclusions.—Cancer of the vulva, even when the disease is extensive, may be removed with very little danger to life.

If the lymphatic glands are affected they should be removed, either at the time of the operation for the primary disease or as soon after as the patient is fit for the operation, provided they appear to be within reach of complete removal.

The contents (fat and glands) of Scarpa's triangle should be cleared out in every case, whether the glands are apparently diseased or not, unless there is a decided indication to the contrary.

In those cases in which the disease is on both sides of the vulva, or in which it has almost reached the middle line, the contents of Scarpa's triangle on both sides should be removed.

In cases in which the primary disease is of limited extent and not deeply fixed, and the glands are removed before they are obviously diseased, the prognosis is hopeful. But, in cases in which the disease of the vulva is very extensive and has penetrated deeply into the subjacent parts, or in which the lymphatic glands are already cancerous, the prognosis is very bad. Yet, even some of these cases are not hopeless.

Inoperable disease of the lymphatic glands does not contra-indicate palliative operations for the primary disease.

Operations for recurrent disease may be practised on precisely similar lines to those which regulate the performance of operations for the primary disease; but the prognosis is much less hopeful.

CHAPTER XXIX

VAGINA

Both sarcoma and carcinoma may attack the vagina; neither of the two is common, but sarcoma is much the rarer.

Since Breisky published his account of sarcoma in 1886 (*Deutsche Chir. Lief.* lx. 163), Gow has given a good description of the disease in adults, and D'Arcy Power in children (*St. Bart. Hosp. Rep.* xxvii. 97 and xxxi. 121, 1891 and 1895). But the most complete account of the disease generally has been drawn up by Pick (*Archiv Gynäkol.* xlvi. Hft. 2, 1894) from thirty-two cases, seventeen of which occurred in adults, fifteen in children. The vagina may be the seat of round or spindle-celled or mixed forms of sarcoma, but the spindle-celled are the most common. The tumour may take the form of a prominent, smooth, polypoid growth, resembling a myoma or fibroma; or of a flattened mass infiltrating the vaginal wall beneath the mucous membrane. It may attain a considerable size in the first class of cases, and may ulcerate early in the second class, so that it may well be mistaken for an epithelioma. Instead of a single growth, there may be multiple tumours. The first symptoms may be the appearance of a tumour at the vaginal orifice or the discharge of blood and offensive pus, and in some instances there are radiating pain and general discomfort. Removal of the tumour, whether single or multiple, is usually followed by recurrence, and this may take place several or many times in succession with great rapidity, even when the base of the growth has apparently been carefully removed. Death may be caused by these repeated new growths, and by the exhaustion due to their presence and removal; or secondary tumours may be developed in the lymphatic glands, not only of the pelvis, but of the groin, the axilla, and other parts of the body. Some of the cases, especially the cases of sarcoma mingled with fibrous tissue

(fibro-sarcoma), may cover a long period of time, but there are also instances which show that the course of the disease may be very rapid. The formation of secondary growths in distant organs and tissue appears to be comparatively rare. The growth may arise either in the anterior or posterior wall of the vagina, and at any point between the orifice and the uterus.

In children there is an almost constant disposition for the growth to become polypoid and multiple, and it rarely ulcerates. Mr. Power says it does not usually affect the lymphatic glands, or disseminate, but recurs almost invariably after removal and kills chiefly by interfering with the action of the pelvic organs. It is not limited to the vagina, but appears to arise simultaneously in other of the pelvic organs, the bladder, uterus, urethra.

Carcinoma of the vagina is usually of the squamous-celled variety. It is a disease of adult life, but occurs in many instances at rather an earlier age than carcinoma generally does. Thus, the proportion of cases occurring in women under thirty years of age is quite considerable. It attacks the posterior much more frequently than the anterior wall, and may present the form either of a papillary growth or of a flat infiltrating tumour which speedily ulcerates. The disease may cover a large area of the interior of the vagina, and may extend to the vaginal portion of the uterus, but does not often spread to the vulva. Extending in depth, it may affect the bladder and urethra or the rectum, and fistulous passages may be formed between these cavities and the vagina. It may make its way, too, into the peritoneal cavity. Secondary affection of the inguinal and pelvic glands may occur, but it does not appear to be prone to metastasis. It usually proves fatal at a comparatively early period. The diagnosis in the earliest stages depends chiefly on the discharge of offensive fluid and blood from the orifice of the vagina.

Methods of Operation.—The method of removing a malignant tumour depends more on the outward form of the growth than on the precise nature of the disease. The multiple growths, which have been noticed chiefly in children, have not, so far as I am aware, been successfully dealt with. In one instance which came under my own observation, several of the tumours were ligatured and came away, but without any decided effect on the course of the disease.

Prominent polypoid masses may be cut off and the supplying artery may be ligatured, or the pedicle may be first ligatured and the tumour then removed. But whether the pedicle be large or small, if the tumour is a sarcoma this treatment will certainly be followed by recurrence of the disease. It is essential that the seat of attachment should be removed, and the removal should be very free. The patient must be placed in the lithotomy position, the legs held by assistants or fixed by means of Clover's crutch, as in the operation for ruptured perinæum. A vaginal duck-billed speculum is introduced, with the blade on the opposite wall to the tumour. The tumour is seized with a pair of vulsellum forceps and drawn down so that, if possible, its base shall be external to the vulva. The seat of attachment is then freely cut out with knife or scissors as deeply as appears necessary. The cuts should be short, so that the bleeding vessels may be taken up and ligatured as they are divided. If the base of attachment is small, the edges of the wound may be brought together with silk or catgut sutures in such a manner as to leave a longitudinal scar; but if the incision has been carried deep, it is desirable to insert at the lower part a small tube or piece of gutta-percha tissue, otherwise pus may collect and decompose, and so give rise to septic poisoning.

The removal of infiltrating growths, when they cover only a small area and are low down in the vagina, is not more formidable than the operation which has been just described; for the parts affected may be actually brought down external to the vulva. The operation is performed in the same manner as when the growth is prominent. But it is far more difficult, and may be dangerous, when the disease occupies a large area of the vaginal wall, when it is situated high up in the vagina, perhaps reaching to and involving the portio vaginalis of the uterus. The operation may be made even more difficult by adhesions of the uterus and vagina due to past perimetritis, thus preventing any attempt to draw the parts down beyond the vulva.

Formerly, the operation described and practised by Schroeder was advised. The disease was removed by cutting from above downwards, beginning at or as close to the uterus as was necessary, and working down towards the orifice of the vagina. During the last few years, probably largely due to the teaching

of Olshausen, Duhrssen, and others, it has been the practice to remove the affected part of the vagina from below upwards. Olshausen's operation is probably more frequently performed than any other, so that it is desirable to give a detailed account of it (*Centralblatt f. Gynäkol.* xix. 1, 1895). Liberally translated, Olshausen's description is as follows: The perinæum is incised transversely, and the dissection is carried up between the rectum and vagina as high as Douglas's pouch. The separation (with a blunt instrument) of the vagina from its bed is made under control (by an assistant) from the rectum. If the uterus is to be removed, Douglas's pouch is opened behind the vagina, the uterus is tilted backwards and loosened at the ligaments, working on both sides from the tubes towards the cervix. When this has partly happened, the vagina is cut through at the limit of the separated portion with scissors, and the carcinoma thus released. Finally, after separation of the bladder with a blunt instrument, the detachment of the cervix uteri is completed.

If the uterus is not to be removed, the first portion of the operation is performed in precisely the same manner. Separation with a blunt instrument is made between the rectum and vagina, as far up as the attachment of the wall of the vagina with the cervix. In the space thus procured, the side walls of the vagina are separated so far that the new formation and its surroundings are completely loosened from their bed. Then the connection is made at a proper point above the disease from the lumen of the vagina to the space between the posterior vaginal wall of the rectum. The further separation of the loosened carcinoma with the scissors is simple.

With a very narrow vagina and occlusion of its lumen owing to the extent of the disease, the last act of the excision may be made decidedly easier if, after loosening the wall of the vagina from its bed, the lower part of the posterior vaginal wall from the frenulum is cut in sagittal direction up to the limit of the new growth. The two flaps of the sound, lowest portion of the posterior vaginal wall, thus formed, can be held apart from each other right and left, can be twisted, and by this means the field of operation can be rendered more accessible to the eye. The final division of the diseased structures is then more certainly made.

Various modifications of Olshausen's proceeding have been

suggested to meet individual cases, but the operation I have just described is the foundation on which operations from below upwards are performed.

In place of the knife and scissors, the cautery is sometimes preferred. Mackenrodt (*Centralblatt f. Gynäkol.* 1896, p. 126) reports ten cases in which he has removed the uterus and a large part or the whole of the vagina with Paquelin's cautery. He first makes a vagino-perinæal incision with the cautery and then separates the os from the vagina, opening Douglas's pouch in doing so. Subsequently he strips off the diseased vaginal wall from its bed.

Results of Operations.—I have added to the cases collected in the former edition a sufficient number to bring the total up to seventy-five cases, of which the disease was sarcoma in thirty-seven and carcinoma in thirty-eight. The equality of the numbers must not be taken as a proof of the equal frequency of the two diseases. Carcinoma is probably far more frequent than sarcoma, and the comparative rarity of the latter disease has led to the publication and collection of cases which would not have been thought sufficiently interesting for publication had the disease been of common occurrence. For some purposes the two diseases may be taken together. It is only when the cured cases are considered that it is desirable to take them separately.

Deaths due to the Operation.—Seven patients died of the operation—a high mortality, reaching nearly ten per cent. Nor is this to be explained either by the age of the patients or by very great severity of the operation. Only one of the patients was a child (nearly three years old), and the adults were not advanced in years. In not one of the cases was the uterus entirely removed, although a portion of it was taken away in one or more of them. Nor was the cause of death such as might reasonably have been expected; for only one patient died of peritonitis (the little child), and only one died of sepsis. Three of the cases were fatal from continued suppuration and hæmorrhage and two from pulmonary embolism (!). One reason of the large mortality appears certainly to have been the weak condition of some of the patients at the time of the operation. There had been repeated hæmorrhages in one instance before the removal of the growth. The occurrence of fatal pulmonary embolism in two cases may be no more than a

curious accident. But it is worthy of notice that Bumm (*Centralblatt f. Gynäkol.* 1894, p. 689) records two cases of pulmonary embolism after division of the recto-vaginal septum. Both operations were performed for prolapse of the uterus. Happily, both patients eventually recovered.

The relative mortality is certainly much less for the later than for the earlier cases. In the twenty-four cases which I put together for the last edition, there were three deaths certainly due to the operation, and I thought that one, or even two, more fatal results ought to be charged against the operation. Taking only three fatal cases, the proportion is one to eight (12½ per cent.). In the fifty-one later cases the mortality was not more than three (six per cent.), and the operations, as is the case in regard to operations for malignant disease in many other parts of the body, were more, rather than less, severe.

Of the ten cases in which the operation was performed by Mackenrodt solely with the galvano-cautery, two were fatal, one from exhaustion, the other from septic peritonitis. But it must be taken into account that the uterus was removed in every instance.

I do not know what method of dressing was employed in the different operations. But I believe that, where a large raw surface is left behind, the best dressing is iodoform or cyanide gauze, carefully laid down upon the whole surface of the wound, so as to keep the front and back walls of the vagina from coming into contact. This dressing should be renewed at least once a day, when the cavity should be washed out with antiseptic solution. By this means the danger of secondary hæmorrhage is largely diminished, and the suppuration is reduced to the smallest possible quantity.

Cures due to Operation.—Recurrence of the disease is recorded in thirty-three of the cases, and of such a character that the patients were actually dead or were not in a condition to bear an operation for its removal. Thirteen of these patients were suffering from carcinoma, twenty from sarcoma, and one patient had died from what was described as metastasis of sarcomatous disease. One patient died of sepsis not very long after the growth had been scraped out, but the sepsis was not ascribed to the scraping, as abortion had been procured at the same time. Two patients were well from one to three years after the removal

of the disease. Seven patients had lived more than three years after the operation. In five of these the disease was sarcoma, and the duration of life up to the date of the last report was three years, four years (two cases), seven years, and eleven years. In one of them the disease had extended to the broad ligament, the diseased portion of which was removed. In the other cases it was limited in extent and confined to the wall of the vagina. Four of the five patients were adults, but the age of the fifth patient is not stated. In no instance did the disease consist of multiple tumours : in no instance was there removal of lymphatic glands, and in no case was there occasion to perform a second operation. In one of these cases a second sarcoma is reported to have formed, and to have been removed seven years after the first operation, so that this case cannot be regarded as a true success, since the second tumour may have been a very late recurrence of the first.

Two patients suffering from carcinoma were well three years after operation. In one of them, the disease was limited to the vagina. In the other, it affected the posterior lip of the os uteri, which was taken away at the same time. Recurrence took place in the uterus, which was removed more than three years after the first operation, and the patient was well and free from disease more than three years after the second operation.

From these figures it might be assumed that sarcoma is more amenable to operation than carcinoma ; and, on the other hand, that sarcoma is more liable to recur *in situ*. But it would be rash to form too hasty a conclusion on these important points. The very reasons which have led to the collection and publication of a comparatively large number of cases of sarcoma have led to a much more careful observation of the individual cases. They have been observed over a much longer period of time after the operation, so that only three of them were lost sight of within the first few months. The further history of all the other cases is supplied, and we are informed of what happened to them. Of the thirty-eight patients who suffered from carcinoma, on the other hand, no fewer than twenty-one were lost sight of either immediately after their recovery or within the first few months. It is quite certain that recurrence took place in some, if not in many, of them; and we may be equally sure that a few successful cases would have been discovered if the further history had been sought for. We may almost venture

to hope that the success of operations for carcinoma is nearly equal to that of operations for sarcoma. Probably, at least fifteen per cent. of successful cases may be looked for from operation for malignant disease of the vagina. It is not a result to be proud of. But the difficulties in dealing successfully with the disease must be taken into account. The earlier stages of the disease are likely to pass unobserved, and, even when the presence of growth is discovered, there is often doubt regarding its nature. By the time operation is performed, it has often extended to the uterus and the neighbouring structures. The glands liable to be affected are within the pelvis and abdomen, so that they are out of reach of an operation. Only the milder cases, therefore, in which the glands remain sound, can be successful. And only those in which the disease is limited in extent and is not deeply seated are likely to be successful.

With regard to operations for recurrent disease, they are much less likely to be successful than operations for the removal of the primary disease.

Are patients who are not cured relieved by operation?—In the majority of the patients who have recovered from operation, recurrence of the disease has been so rapid that only a very short period of relief has been procured. And when the disease recurs *in sitû*, the distress produced by it is precisely the same for the recurrent and for the original disease. So that the only benefit which can be hoped from the operation in such cases is the short period which elapses between the recovery from the operation and the reappearance of the disease. In some cases, however, the mere scraping out of a mass of malignant disease from the interior of the vagina, without any intention of performing a radical operation, is attended by great relief. Such an operation may be repeated from time to time in order to alleviate the sufferings of the patient.

Conclusions.—The prospect of permanent cure of malignant disease of the vagina by operation is not good, certainly not more than thirteen per cent. to fifteen per cent.

The disease should be removed as early as possible.

The cases in which it is of small extent and not deeply set offer, as might be expected, the best prospect of success; particularly if the growth is limited to the wall of the vagina, and does not affect the uterus or bladder.

Infiltrating primary disease and recurrent disease are the least hopeful of all cases for operation.

Cases of multiple tumour appear to be quite hopeless from the operative point of view.

I can only urge upon practitioners the vital importance of an examination of the vagina in all cases of continued discharge and discomfort; and the desirability of removal of a small portion of the diseased part for microscopical investigation in all cases of suspected malignant disease.

It may be remarked, before concluding, that if malignant disease of the vagina were submitted to operation at a much earlier period of its existence than has usually been the case, the results would almost certainly be far better than they have appeared from the foregoing facts. There are no anatomical conditions in the vagina, especially in connection with its lower part, which need favour such extremely rapid growth and great tendency to recurrence after removal, as have been exhibited. It is true that the period during which the disease had existed in many of the cases was said not to have been more than two, three, or four months. But it is probable that it was far longer than this in some, if not in many, of the patients. The earliest signs of malignant disease are often merely a discharge from the vagina, associated with perhaps little pain and no discomfort, and this symptom is of such common occurrence, and is due to so many different causes, many of them of trivial importance, that the patients are not led to seek advice at a sufficiently early period; and if they had sought advice, many of them would only have received prescriptions, but would not have been subjected to an examination of the vagina. It is difficult to alter this condition of things, and at present there seems little hope that it will be mended.

CHAPTER XXX

UTERUS

By ALBAN DORAN, F.R.C.S.,

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The surgical treatment of cancer of the uterus naturally occupies a large measure of our attention, on account of the frequency with which the disease occurs, its distressing nature, and the advances which have of late years been made in abdominal and uterine surgery. The material from which the subject can be studied is very rich.

The uterus is liable to carcinoma and to sarcoma, but the latter disease is rare in that organ, whilst the former is undoubtedly very common. It is equally certain that the cervix is far more often attacked than the body.

All authorities are now agreed in distinguishing a cancer of the vaginal portion of the cervix (included by a line drawn from the external os upwards and outwards in all directions to the attachment of the vagina) and a "cancer of the cervix" originating in its canal. As might be expected, epithelioma may develop in the stratified epithelium forming the outer investment of the "portio," whilst gland-cancer may begin in the glands in the substance of the cervix.

Cancer of the vaginal portion is usually superficial, and seated on one or both lips of the os. In its earliest condition, rarely detected except by accident, it appears as a somewhat livid spot, which bleeds on touch. The epithelial ingrowths cause increased vascularity, hence the colour of the seat of disease. In many cases the cancer soon becomes more or less papillary, if not so from the first. Cancer of the vaginal portion tends to spread, not so much upwards into the cervical canal, and into immediately subjacent tissues, but rather on to

the vagina and thence into surrounding parts. The lymphatic glands may be affected, and secondary deposits may develop in other organs.

Cancer of the cervix usually occurs as a nodule in the substance of the cervical wall, which ulcerates speedily or slowly; possibly a cancerous ulcer is sometimes primary. It involves at an early period the wall of the uterus itself, and extends into the cellular tissue of the pelvis. It may also spread in the contrary direction, downwards towards the vagina.

Cancer of the body of the uterus, far rarer than cancer of the cervix and portio, may form a papillary growth of a great part or the whole of the interior of the cavity, or may occur as a polypoid mass with an indurated base. It has comparatively little tendency to spread into the cervix, but extends peripherally towards the peritoneum, and at a later period produces secondary nodules in the cervix and vagina. The retro-peritoneal and lumbar glands are attacked, and dissemination may take place in many organs.

Cancer of any portion of the uterus is a disease of adult age, and though many cases occur in women between thirty and forty, it becomes much more frequent after the fortieth year. It is not only a very fatal disease, producing death, in the great majority of instances within a year or eighteen months after the first symptoms are noticed, but it is a terrible malady on account of the pain, profuse and offensive discharge, and the frequent hæmorrhages with which it is so often associated. Death is partly due to these causes, to peritonitis and pyæmia, and to uræmia from pressure on the ureters, and partly to the early and extensive occurrence of dissemination. The implication of neighbouring organs, such as the rectum and bladder, renders the condition of many of the patients pitiable in the extreme.

Sarcoma usually attacks the body of the uterus; rare even there, it is yet rarer in any part of the cervix. At the end of this chapter a few words will be said on deciduoma malignum, here it need only be observed that Eden and Kanthack suspect it to be ordinary sarcoma coincident with pregnancy. A remarkable racemose polypoid growth has been found springing from the cervix and filling the vagina. Its histology is remarkable. Pernice found embryonic striated muscle-cells in one specimen. It is certainly a sarcoma. One remarkable feature about this

racemose tumour is that it usually appears in early girlhood, more rarely after the menopause, and is rarest during the age of active sexual life. The surgeon must remember that it is extremely malignant, and so when he meets with an odd-looking pedunculated tumour in a girl or an elderly woman, he must examine it carefully, and if it corresponds in appearance to the racemose malignant polypus of the cervix, the entire uterus must be removed. The commoner forms of sarcoma may attack the cervix. A spindle-celled sarcoma of that part usually feels hard, as it is surrounded by somewhat dense tissues.

Sarcoma of the uterine body may be round-celled or spindle-celled. The former sometimes takes the form of a diffuse infiltration of the uterine wall. Spindle-celled sarcoma is usually more defined, it may contain much fibrous tissue. When the submucous tissue is involved, a sarcoma assumes the form known as malignant polypus. All these varieties of sarcoma of the body are most frequent towards or at the menopause. They are very malignant, and tend to exhaust the patient by hæmorrhages. Peritonitis and septic changes may occur, and lastly secondary deposits appear in the lymphatic glands, lungs, liver, vertebræ, and other parts of the body. Mere enucleation of a sarcoma from its site in the uterine wall is useless; all forms of sarcoma demand hysterectomy, unless, as is too often the case, the growth has already spread too far when it is first diagnosed. The course of a typical sarcoma of the uterus is somewhat slower than that of a cancer. But in some of the cases described as sarcoma lasting for many years, the earlier symptoms may have been due to submucous fibroids or to endometritis.

Cancer and sarcoma of a "fibroid" or fibro-myoma of the uterus are not unknown. I have come across one case of sarcomatous degeneration of a large uterine fibroid. Sudden increase of growth of a previously quiescent fibroid gives grounds for suspicion. When a tumour is removed under these circumstances, the operator and pathologist must not mistake mucoid degeneration and œdematous connective-tissue for sarcomatous growth. Cancer of a fibroid most probably arises from the uterine mucous membrane. Common cancer of the portio and cervix is sometimes seen when the uterus is the seat of myoma.

Methods of Operation.—Palliative measures, such as the use of the cautery, curette, or caustics, belong to the domain of gynæcological therapeutics. Whenever the uterus appears to be movable, and there is no invasion of the vaginal fornices or parametrium by the growth, it should be removed. This rule applies to cancer of the original portion of the cervix and of the uterus, also to sarcoma of the same parts. When the uterus is involved and has grown too large to be safely removed through the vagina, panhysterectomy is indicated. In any other case vaginal hysterectomy is now usually performed.

Amputation at the vaginal portion of the cervix, as practised for hypertrophy of that part, is futile. Supra-vaginal amputation of the cervix was, until recently, very popular in this country. But the more complete operation can now be performed with as little or less risk. In supra-vaginal amputation of the cervix, as Sir John Williams, one of its advocates, has pointed out, recurrence usually takes place in the parametric tissue and not in the stump. But Herman has rightly shown that there may be cancer in the cervical canal above the line of incision, that scraping and scooping manœuvres beyond that line prevent plastic suture of the mucous membrane, so as to avoid stenosis and atresia, and that, though the uterine vessels are accessible, the ovarian arteries cannot be tied, so that troublesome oozing may ensue.

Removal of the Uterus through the Vagina.—The patient is placed in the lithotomy position, and the cervix drawn down by means of a volsella. Some operators sew up the cervix, others scrape it and apply the cautery to the entire cancerous cervix—the latter method seems the more advisable. All instruments used for the above purpose are then put aside. The cervix is pulled against the symphysis by a volsella and the posterior vaginal fornix is laid open. The hole made into Douglas's pouch is best enlarged by tearing. A sponge on a string or a strip of gauze may be passed into this wound if there be much bleeding, otherwise it is hardly necessary. The cervix is now pulled backwards towards the perinæum, and another incision is made, in the anterior fornix. Both the vaginal incisions must be made at a fair distance from the growth; and the extremities of the anterior are made to join those of the posterior. A sound being passed into the bladder

by an assistant, the operator carefully dissects the bladder away by cutting upwards close against the cervix. The bladder must be well freed, especially in its lateral aspects. The utero-vesical fold is then laid open with great care.

The next step is the ligature of the broad ligaments. The cervix is drawn towards the right, then an aneurysm needle armed with stout silk is made to transfix the left broad ligament. The ureter must be remembered, the ligature must be tied far enough from the uterus to allow a fair amount of tissue for safe division with the scissors. When the ligatured piece of broad ligament is thus divided, the needle is passed through the ligament higher up and another portion tied and divided. A third ligature, including the Fallopian tube, is then passed, and on dividing the tube and tissues on its uterine side the uterus is completely freed from the left broad ligament.

The right broad ligament is secured in the same manner, then the uterus will come away. The vagina is then lightly packed with antiseptic gauze, which is left there for about a week.

The above description will give the reader a general idea of the operation. Authorities differ widely as to matters of detail. Some make the anterior vaginal incision first, then dissect off the bladder from the cervix, make the posterior incision, lay open Douglas's pouch, and finally open the utero-vesical fold. The aim in this case is to begin with the most difficult step, the separation of the bladder, whilst other relations remain undisturbed. Some prefer pressure-forceps to ligatures for securing the broad ligaments. They are left on for forty-eight hours. Mackenrodt uses the cautery, but it is not a safe guarantee against hæmorrhage and has other obvious disadvantages. A favourite manœuvre is forcible retroflexion of the uterus; A. Routh prefers to rotate the fundus into the anterior wound as then the cervix can only soil parts which will be in the line of drainage. In retroflexion of the fundus, the diseased cervix may foul the peritoneum high up behind the pubes. The torsion of the second broad ligament, after the first has been divided, by flexion of the uterus certainly facilitates ligature. But many operators dispense entirely with rotation of the fundus. The question of removal of the ovaries and tubes is too complicated for consideration here. They are often left behind without evil results.

The most disputed question is the management of the flaps.

It appears that they tend to close rapidly, being coated with lymph at the end of twenty-four hours. Kaltenbach, however, practised closure of the flaps by suture, and his results, as will be seen, were excellent. Hegar agrees with him, and Martin, Fritsch, Leopold, and Olshausen, once supporters of drainage, now close the peritoneal cavity either with continuous catgut or with a purse-string suture. Howard Kelly takes an intermediate course. He unites the peritoneum with one or two sutures in the middle—at the point once occupied by the cervix—leaving a little opening on either side for drainage. This method, he declares, supports the intestines and lessens the liability to prolapse. Hegar maintains that, if there has been no infection of the peritoneum, drainage, and the leaving of free flaps is needless, whilst, if it has been infected, such precautions are useless. Many British operators, however, find that sewing the flaps only wastes time, and consider that it is quite superfluous. If the surgeon think that it is advisable to suture the flaps, he must include the stumps of the broad ligaments in the sutures.

If the Fallopian tubes or ovaries be diseased, they must be removed; the vessels must be tied with care when the appendages are drawn down.

Panhysterectomy.—Cancer or sarcoma of the body of the uterus, and malignant degeneration of a uterine fibro-myoma are best treated by this operation. Year by year our experience of panhysterectomy increases. Statistics, however, are as yet too scanty to be of value, and the operation can never be made easy. I feel, however, that it lies clearly forward on that line of progress which began with the establishment of ovariotomy as a justifiable operation. Decidedly it will yet be simplified.

I will describe the steps of the operation as practised by Howard Kelly, who performs it for cancer of the cervix as well as for malignant disease of the body of the uterus. When the cervix is involved it is scraped thoroughly, cauterised and sewn up; indeed, Kelly closes the vaginal vault. The ureters are catheterised so as to be converted into rigid cords, within easy touch, relieving the operator from great anxiety when applying ligatures. The disinfected vagina is filled with a loose plug of iodoform gauze. The pelvis is elevated and a free abdominal incision made, so as to expose the field of operation. I can testify to the high value of the Trendelenberg position when

manipulations of any structure in the pelvic cavity are required. The broad ligaments are now secured by ligature as in retro-peritoneal hysterectomy. The vesical peritoneum is detached, as in that operation, and the bladder also set free from the uterus down to the anterior vaginal fornix. The pelvic vessels being exposed by this dissection, the uterine arteries are tied close to their origin; they are then freed with the surrounding cellular tissue from the pelvic wall to the vaginal vault. The catheterised ureters are set free and pushed aside from the field of operation. The uterine veins, above and below the ureter, are tied near the pelvic wall.

Then comes one of the essential steps of this operation. All enlarged glands in the widely exposed pelvic floor are dissected out with the cellular tissue around them. The uterus, with broad wings of connec-tivetissue, is freed down to its vaginal attachment, and the vagina opened (at least three quarters of an inch beyond the lowest limit of the disease), anterior to the cervix, with a thermo-cautery. The opening in the vaginal vault is continued around to the right and to the left, until the uterus is entirely freed. As soon as the vagina is incised anteriorly a loose iodoform gauze plug is pushed in, and as soon as the opening is large enough to permit it, the lower part of the uterus and the vaginal vault are enveloped in gauze, so as to prevent any discharge from contaminating the wide internal wound. This gauze wrap, Kelly assures us, affords an excellent hold for the operator in making traction upon the uterus as it is gradually delivered. Bleeding vaginal vessels are controlled by catgut ligatures passed through the vaginal wall, but not including the mucosa.

Oozing vessels on the wound surface are controlled by catgut ligatures, and the surgeon now makes sure that all the threads on the big vessels are really securing them. Then the surface is covered in, as in retroperitoneal hysterectomy, by continuous suture of the divided pelvic peritoneum. The abdominal wound is now closed, unless there has been some escape of the uterine contents into the peritoneum, in which case, the patient's pelvis being lowered till it lies horizontally, the pelvic cavity is thoroughly washed out. Lastly the gauze in the vagina is changed, and a piece of washed-out iodoform gauze passed loosely up between the lips of the wound, so as to give a little support to the sutured peritoneum above, and

to avoid any accummulation of fluids within the wounded area.

This operation seems clearly a step in the right direction, but it is only an operator well experienced in abdominal surgery who could perform it. Kelly admits that it lasts from one hour to an hour and a half or even two hours, and that it is far more difficult than the vaginal operation. The results of the latter are, as has been shown, not unsatisfactory, and those who have practised it successfully are not likely to abandon it. The abdominal operation is so new that there are practically no statistics as to recurrence.

Results of Operations.—Every surgeon knows that it is not possible to guarantee any patient against recurrence when even a very small mammary cancer is removed with the entire breast and a wide area of perfectly accessible tissue, and when the greatest care is taken to expose and remove the axillary glands. Sheild's researches have fully confirmed the general opinion of surgeons on this question. The same applies to cancer in most other parts. The uterus lies in a very inconvenient position, and for anatomical reasons any free clearing of adjacent healthy structures is out of the question. Hence, no hysterectomy on Mitchell Banks and Gross' principles is possible, though the Baltimore school have practised manœuvres to reach and excise the glands from the abdominal side.

Vaginal hysterectomy has, therefore, been condemned on *à priori* grounds. Experience has proved that the case of the cancerous cervix (and indeed of the uterus as well) is exceptional, and that recurrence is not so rapid nor even so inevitable as surgical homology would tend to show. The disease does not spread rapidly to neighbouring parts, and glandular infection is remarkably slow. Of course, when the parametrium is once involved recurrence is certain, and the knife seems to stimulate the growth of the cancer. Mackenrodt, in examining several amputated uteri, discovered cancerous tissue on the cut surface of the organ corresponding to its parametric attachments. On the other hand, operators are careful to confine their operations to cases where the uterus is still freely movable and the attachments uninvolved, as proved by skilful digital examinations and the use of the speculum. It must often happen, however, that they overlook incipient parametric infiltration, insufficient to be recognised by touch. In consequence,

only some twenty to twenty-five per cent. seem permanently cured, whilst very rapid recurrence takes place in a considerable proportion of the patients.

Mortality.—Statistical records from different quarters confirm what has been said in the above paragraph. The operation is not very dangerous. Thus, out of twenty cases of cancer of the cervix where it was performed by my colleague, Dr. Amand Routh, at the Samaritan Hospital, nineteen recovered, the one where death occurred was an alcoholic subject. Ten cases of vaginal hysterectomies for cancer of the fundus, by the same operator, all recovered save one, where death occurred from acute mania on the twenty-first day. Richelot lost three in forty-four, or under seven per cent.; Landau eight in 110 or $7\frac{3}{4}$ per cent. Krückenberg reports 197 cases of vaginal hysterectomy (specified as for cancer of cervix) in a Berlin hospital between 1878 and 1891. Twenty-five died, or a little over $12\frac{1}{2}$ per cent.

Cures effected by Operation.—Kaltenbach's results, tabulated by Baecheler, seem brilliant. He, in ten years ending 1894, did 159 vaginal hysterectomies with suture of the peritoneum; 134 were for cancer of the cervix, fifteen for cancer of the body, four for sarcoma, and six for non-malignant affections. Only six of the 134 cervix cases died of the operation.

In ninety-three of his cases, the operation had been performed more than three years previously, and the results are as follow:

Died of the operation	3
Dead or alive with recurrence	47
Alive with probable recurrence	2
Lost sight of	16
Died of other disease within three years	2
Died of other disease after three years	4
Alive and well after three years	19
Total	93

There were thus twenty-three successful cases out of a total of seventy-five, in which the result was known more than three years after the operation.

Considering the nature of the operation and the circumstances under which it is performed, vaginal hysterectomy for cancer appears to be justified by these statistics, if only a fair

proportion of the patients enjoy complete immunity from recurrence. British statistics are of little value on account of the great difficulty in tracing both private and hospital patients, especially the latter, who remain immune. Thus nine of Routh's nineteen cases of hysterectomy for vaginal cancer have been lost sight of. On the other hand, Richelot traced twenty-eight of his forty-one recoveries. In eleven recurrence took place between four months and five years after operation. He includes no case in which he did not perform the first operation, or in which incomplete operations had already been performed on the cervix. Out of seventeen alive and free from recurrence, eight had been operated upon over two years before the statistics were issued. In Krückenberg's statistics recurrence took place within twelve months in at least sixty-nine of the 172 patients who recovered from the operation. Nine were living at the end of nine years, free from recurrence.

These results, when we remember what cancer means, are not unsatisfactory. Burckhard, who has carefully watched recurrences in a series of fifty cases, noted five between the first and second year and two between the second and fourth. Many cases in Richelot and Krückenberg's series had a similar fate. The operation clearly gave them a lease of life free from the peculiar sufferings inevitable when no operation is performed. Other experienced observers, however, are sceptical about the results of operation. Halliday Croom believes that the surgical method of dealing with uterine cancer has done little either to ameliorate suffering or to prolong life. In his opinion, palliative measures are alone suitable when once a uterine cancer is recognised.

Cancer of the body of the uterus is relatively rare, and opinion differs as to whether vaginal hysterectomy or panhysterectomy be the preferable operation. In thirty cases of vaginal hysterectomy collected by Krückenberg, three died of the operation. Recurrence within the first year occurred in eight. Lewers (*Trans. Obst. Soc.* vol. xxxvi.) performed the operation six times without a death. The results were good. One was free from recurrence four years after operation, one two years after, one about twenty months after, one fourteen months after, and one a year after, whilst recurrence took place in one in about eleven months. The uterus may be too large

to be safely extracted through the vagina. A soft, bulky uterus is likely to tear, involving dangers from hæmorrhage, sepsis, and the handling of malignant tissue. In such a case panhysterectomy is indicated; sometimes it has to be done after the vaginal incisions have been made, and removal through the vagina is found impracticable. Sarcoma of the uterus requires the same treatment as carcinoma and so does deciduoma malignum.

Malignant degeneration of a uterine "fibroid" (fibroma or myoma, usually mixed) is not often discovered until the abdomen is opened. It remains localised for long and hence supra-vaginal amputation is often successful and not followed by recurrence. Panhysterectomy is the only resource when the cervix of a "fibroid" uterus is discovered to be the seat of incipient cancer.

Satisfactory statistics of operations on malignant disease of the body of the uterus are not at our disposal, as such diseases are not frequent and are apt to baffle diagnosis, until it is too late for surgery. Panhysterectomy is not easy, but it will doubtless be rendered easier by further experience; such is already the case with vaginal hysterectomy. Indeed, Howard Kelly has discarded the latter operation for the former, even in cancer of the cervix, except in fat women, where his practice of wide excision of the broad ligaments and removal of pelvic glands is almost impossible on account of the mechanical hindrances due to the thick walls and deep pelvis.

Uterine Cancer and Pregnancy.—This subject lies chiefly within the domain of obstetrics. For valuable statistics on the treatment of uterine cancer in pregnancy and labour, the reader is advised to consult Theilhaber's communication in the *Archiv f. Gynäkologie*, vol. xlvii. 1894; 165 cases are analysed. The surgeon is concerned with two questions, the mortality of spontaneous birth at term and the best operation for the saving of the child and the temporary saving of the mother. In ten cases of spontaneous birth at term eight mothers survived childbed, one died from rupture of the cancerous cervix, and one, where the cervix had been previously amputated, died on the sixth day. Three children at least were saved, five are reported as dying during or after labour, whilst there is no note about the remaining two. Though in many respects highly defective, these statistics show that there is much peril

to the child in labour when the uterus is cancerous. But Cæsarean section during pregnancy is of course far more dangerous in cancerous cases than in others. Yet out of fourteen cases collected by Theilhaber twelve children were saved, a fact not to be forgotten. In four the mother survived childbed, and lived in comfort for awhile. In five she died from puerperal causes. In four death occurred soon after childbed from exhaustion or bleeding from the cancer. In one the fate of the mother is not recorded. Thus, when obstetric measures are held to be dangerous by the expert, Cæsarean section may prove more successful, at least as far as the child is concerned. Panhysterectomy was performed by Bischoff and Spencer Wells nearly twenty years ago, but even with the most modern improvements it is rarely practicable in pregnancy owing to the state of the cervix.

Conclusions.—Malignant disease of the cervix or body of the uterus should be treated by amputation of the entire organ, in suitable cases.

The prognosis is not bad for those cases in which the disease is limited in extent and easily accessible; it becomes worse as the disease extends to the vaginal vault and parametrium.

Even in these cases relief may be afforded by operation.

Vaginal extirpation of the uterus has proved satisfactory in cases of cancer of the cervix. The mortality is low, and in a little under a quarter of the cases recurrence does not take place.

Supra-vaginal amputation of the cervix and the removal of the cervix or uterus by the aid of the cautery are now favoured by few.

Time has verified the hope expressed in the first edition of this work that the removal of the uterus through the vagina would become less fatal and more successful as a means of cure, as the method of performing the operation and the management of the cases are better understood.

There is now, however, reason to believe that the same remarks may some day apply to abdominal panhysterectomy, which is homologous to well-known modern developments in the surgery of the breast, and will probably save from recurrence certain cases where infected pelvic glands, inaccessible from the vagina, can be excised. Its time, however, has not yet come, and it may after all prove unsatisfactory, especially

as regards immediate operative risks. In cancer and sarcoma of the body and in malignant degeneration of a fibro-myoma, the abdominal operation is already held to be preferable by many authorities.

Deciduoma Malignum.—This remarkable disease was first described by Sänger in 1889, two years after the first issue of this work was published. Its literature is already voluminous, indeed, the entire subject is one of the most extraordinary in the history of modern pathological research. Already certain observers have endeavoured to distinguish at least four separate malignant diseases of products of conception retained in the uterus: (1) Sarcoma deciduo-cellulare, of Sänger; (2) Syncytial carcinoma, of Kossmann and Ruge; (3) Marchand's serotinal tumour; and (4) Gottschalk's sarcoma of the chorion. On the other hand, certain British observers have declared their doubts about the whole subject. All who interest themselves in the matter should carefully study Dr. Eden's "Deciduoma Malignum: A Criticism," and the instructive discussion upon that treatise in the thirty-eighth volume of the *Transactions of the Obstetrical Society*. Especially important are Kanthack's observations, as that authority seems to be the only general pathologist who has studied this subject. Veit of Leyden has accepted this theory (*Handbuch der Gynäkologie*, vol. iii. part 2, 1899). The obstetrician and surgeon must, on the other hand, remember that Marchand, Ludwig Fraenkel, and others have brought forward well-grounded reasons for believing that relics of a hydatidiform mole are the sources of deciduoma. Herbert Williamson, the most recent writer on that form of mole, cannot, however, agree to this theory without reserve. Like Eden, he implies that the disease is simply uterine sarcoma, stimulated by gestation and parturition.

Unfortunately, whatever it may signify from a purely pathological standpoint, malignant disease of the uterus in young women shortly after delivery or abortion seems to have become very common of late. Vaginal hysterectomy should be performed as soon as possible, as dissemination of the new growth, even as far as the lungs, occurs with a rapidity quite unknown in ordinary uterine cancer or sarcoma.

CHAPTER XXXI

OVARY AND FALLOPIAN TUBE

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The study of the pathology of malignant tumours of the ovary presents difficulties on account of the frequency of complex forms of new growth. Not only are mixed forms of sarcoma found growing in the ovary, but sarcoma occurs mingled with glandular and fibrous growths, as in the mamma. In some cases sarcoma and carcinoma appear combined; the characters of sarcoma and carcinoma are apt to be altered by the presence of cysts ; and dermoid and papillary growths, which at first sight appear to be innocent, are not rarely found to be quite the reverse. Dermoids may undoubtedly undergo malignant degeneration, which is not surprising, as they bear abundant histological elements very irregular in their stages of development. Indeed, we may wonder that dermoids do not as a rule become malignant. On the other hand, papilloma naturally tends to an essentially malignant change, whilst when innocent it often looks malignant. The fact that a papillary tumour should become malignant will not surprise any one who is familiar with the warty surfaces of many epitheliomata. In the Fallopian tube, as I have endeavoured to explain, this degeneration assumes a very definite form, but there the papilloma seems to be a result of inflammation of the tubal mucous membrane. There is no reliable evidence that papilloma of the ovary arises from inflammation. I have, however, seen papillary growths in the dilated follicles so common in old inflamed ovaries.

The limits between sarcoma and fibroma are perhaps more uncertain in the ovary than in any other structure. I know

that several reported "sarcomata" that have not recurred were really fibromata with an abundance of soft, healthy connective tissue between the bundles of fibres.

The histogenesis and exact relation which the varieties of the disease bear to each other are questions unsuited to the present subject. For further information we refer the reader to Martin's *Krankheiten der Eierstöcke und Nebeneierstöcke* (1899). Leopold's treatise on solid ovarian tumours, though twenty-five years old, remains of high clinical value. Papilloma has been specially considered in the writings of Coblentz, myself, Sutton, and lastly, in point of time, Von Recklinghausen.

Contrary to the general rule, both sarcoma and carcinoma are observed with tolerable frequency in youth. As hard fibroma of the ovary is relatively common in girls, probably certain solid sarcomas signify malignant changes in fibromas. I have seen an almost solid cancerous tumour in a young girl, but this condition is very rare. Towards the menopause cystic sarcoma and cystic adeno-sarcoma are frequent. Both ovaries may be involved; this is especially the case with malignant papilloma. Amenorrhœa, long before cachexia sets in, has often been observed. The tumour grows quickly, especially if made up of cysts and soft solid material; this variety may prove fatal in a few months. Short histories are suspicious, as ovarian tumours often escape notice till they have reached a considerable size, particularly in middle-aged women, who mistake them for increase of fat. Even when a tumour has been under our observation for several years and proves malignant, we cannot feel sure that it was not for some time pathologically innocent. Death ultimately follows, in malignant disease of the ovary, from exhaustion, malignant peritonitis, complications due to malignant fistula opening into the bowel, &c., invasion of vital organs and pulmonary embolism.

Ascites is very frequent. Adhesions to neighbouring viscera and to the peritoneum form early, are highly vascular, and tend to become infiltrated with new growth. The intestines are specially liable to invasion, and the liver, lungs, and other solid viscera may become infected. Even in pure sarcoma the lumbar glands are sometimes involved.

The surface of an innocent ovarian growth, free from inflammation, is smooth, regular, shiny, and silvery-white. Its vessels appear small, well-defined, and red or light blue in colour. The

surface of a malignant cyst is usually dull, irregularly tinted with dirty white, blue, and green. Its vessels are big, dark, and unhealthy-looking, as its circulation is faulty. In an innocent multilocular cystic adenoma the outer wall may appear of a dull-green colour and gelatinous, and usually bears large vessels, but the colour is uniform and the vessels, though dilated, look healthy. A firm solid myxo-sarcoma of the ovary bears a remarkable external resemblance to a soft myoma of the uterus. It is often clear, at a glance, when the abdomen is opened, that the tumour is malignant, but the innocence or malignancy of firm, solid ovarian tumours in their earlier stages cannot always be proved without the aid of the microscope.

Methods of Operation.—British experience, as well as the statistics of Kratzenstein, show that ovariotomy is justifiable for the removal of a malignant tumour, provided that it be not evident on clinical examination that the growth has extended to other organs. Dense pelvic deposit, indurated masses in the walls of the abdomen beyond the limits of the tumour, and advanced cachexia are counter-indications. Œdema of the legs is no bar to surgery: it is frequently seen, like ascites, in perfectly innocent tumours.

Ovariotomy is now so widely practised that a minute description of the operation would be superfluous. The skin of the abdomen should be washed in a 1 in 500 solution of biniodide of mercury in rectified spirit (75 per cent.), to which a little water and iodide of potassium are added to dissolve the biniodide, as Lockwood recommends. Sponges stored in a 1 in 20 carbolic acid solution are best kept during the operation in a 1 in 2000 solution of biniodide. Carbolic acid irritates the endothelium, an evil especially to be avoided in cases of malignant disease. The instruments are placed in a 1 in 40 carbolic solution after boiling. The operator and assistant must be specially careful about their hands. If they have recently been engaged in operations on suspicious cases, their hands should be dipped in pure Condy's fluid till deeply stained. To take off the staining the hands are then washed in water containing a few drachms of oxalic acid. After free scrubbing with soap and water the hands are washed with the spirituous biniodide solution and the same fluid should be used to cleanse the hands throughout the operation.

At the beginning the best course to pursue is to examine as

thoroughly as possible the relations of the tumour through a three-inch incision. The very short wound through which a simple cyst can be drawn after tapping is useless and dangerous in these cases. When intimate adhesions to gut bearing malignant tissue, free deposit in the abdominal walls or dissemination over other organs is discovered, it is usually safer not to attempt removal of the tumour, above all when resections of the infected parts are impracticable. The exploring fingers must on no account be passed round the tumour out of the operator's sight. Even inflammatory adhesions bleed freely under the circumstances, infected structures are easily damaged, and small intestine readily torn. Sponges must be carefully packed round the cyst, if any oozing occur, for blood left in the peritoneal cavity is liable to infection by germs passing through the walls of diseased intestine. When it is clear that the tumour is irremovable, the peritoneal edges of the abdominal incision should be closed with continuous catgut or fine silk sutures. Then interrupted deep silkworm-gut thread should be used to close the fascia and integument. I never pass the deep sutures through the peritoneum in these cases, as malignant growth may advance to the skin along the suture-tracks, adding greatly to the patient's future miseries.

Supposing that it be clear that the tumour can be removed, it may be tapped at once, if cystic. A solid malignant tumour requires a very free incision. Even if firm in front it may be softer behind. Its bursting during extraction gravely adds to the risk of the operation, the hæmorrhage may be very severe, and though it can usually be checked by clamping the pedicle, that manœuvre is objectionable on grounds to be explained. A collapsed cyst is far more manageable Adherent omentum must be freely resected ; under the least unfavourable circumstances it is very prone to bleed, whilst malignant infection is common. Even the smallest rent in the serous coat of intestine during the separation of adhesions must be closed by a fine silk suture. I have known the most virulent sepsis to follow neglect of this precaution, even without evidence of cancerous infection of the wounded area. Resection of intestine may be necessary ; it has been done successfully when only one tract of the intestine was infected. When several separate coils, far apart, are involved, it is a vain and dangerous resource. Resection of part of the fundus of the bladder is far more successful.

The pedicle has next to be explored. Sponges must be freely packed around the tumour; indeed, oozing is to be checked from first to last. The case is especially grave when the tumour proves to be sessile. The base must be enucleated cautiously, and as much of the detached broad ligament trimmed away as possible, for it is very likely to be infected. At this stage, the Trendelenburg position is specially serviceable. Free application of pressure-forceps is necessary, with ligature of all bleeding points; the tissues of the empty capsule can usually be transfixed and tied as a pedicle.

Fortunately a pedicle exists, as a rule, in these malignant tumours. It is not advisable to apply the big clamp-forceps to the pedicle as it is often very easily torn, is sometimes infected with the new growth and contains large, possibly diseased, vessels. In consequence, I have known dangerous hæmorrhage, sloughing of the crushed malignant tissues, and large hæmatoceles, as the result of damage from the clamp-forceps in malignant cases. The ovarian vessels should always be tied separately with No. 3 or 4 silk. If the pedicle be broad it is safer to tie the vessel close to the uterine cornu also. The entire pedicle is now tied by transfixion of the broad ligament, the thread is divided in two, and each half (after the ends of the two halves have been crossed on one side) is made to embrace one half of the pedicle and tied firmly. Care must be taken to sink these threads well into the grooves made by the ligatures at the outer and inner borders of the pedicle. The ends of the ligatures are now cut and the pedicle carefully divided. The operator must avoid handling the large vessels in the pedicle as far as possible. They are very apt to get plugged in malignant cases.

The opposite ovary must be condemned and promptly removed if there be the slightest suspicion about its appearance. The ovarian vessels must be tied separately, for the outer border of a small pedicle is apt to slip.

Bleeding points are now sought for and secured, on the parietes and elsewhere. Resections are done at this stage. When there have been few or no adhesions, the peritoneum may be dried with sponges, a large sponge placed in Douglas's pouch and the sutures applied to the wound. But when oozing is inevitable, and in other cases when the operation has been long, above all when much blood has been lost, flushing of the peritoneum is advisable. Water sterilised by boiling and heated

to a little over 100° is freely passed into the peritoneal cavity until it issues quite clear. It brings away fluid blood, other fluids, clots, and broken-off fragments of malignant growth. Lastly, several pints of artificial serum (a drachm of table-salt added to each pint of the sterilised water) may be left in the abdominal cavity. It dilutes any poisonous elements and acts like transfusion. The sickly patient is also saved from much thirst.

The sponges and instruments being counted, the sutures are passed into the wound. Taken as a whole it is best to introduce them after the manner above recommended in incomplete and purely exploratory operations. When, however, the malignant disease is strictly limited to the tumour which is removed, the deep, interrupted sutures may be passed through all the layers of the abdominal wound.

Results of Operations.—*Mortality due to the Operation.*—The most valuable wholesale record of survival after ovariotomy for the removal of malignant ovarian tumours is Kratzenstein's (*Zeitsch. f. Geburtsh. und Gynäk.* vol. xxxvi., 1897, p. 61), based on 100 cases (1872–1892) in Olshausen's practice. Twenty-eight died, more or less directly, from the operation, namely: two after failure to remove the tumour (one malignant papilloma, one solid carcinoma); eleven from septic complications (two fibro-sarcoma, six malignant adenoma, two malignant papilloma, one solid carcinoma); five from metastases present at the time of operation (one sarcoma, two malignant papilloma, two solid carcinoma); four from shock (one sarcoma, one malignant adenoma, two solid carcinoma); one from complications due to twisting of the pedicle (one fibro-sarcoma); one from hæmorrhage (one solid carcinoma), and four from intercurrent diseases (morbus cordis and gangrene of lung—perforating ulcer of stomach—apoplexy—fatty heart). These deaths are directly pertinent to our subject. In an evident case of malignant tumour, the growth may seem partly movable on clinical examination, yet the surgeon may, nevertheless, fail to remove it, finding its walls soldered behind by malignant outgrowths to structures which cannot be resected. Septic infection is always probable in a bad case. The resisting power of the peritoneum and other agencies favourable to recovery are impaired. Above all, the separation of a trifling adhesion to the alimentary canal or bladder may allow of infection from those

quarters, cancerous tissue permitting germs to pass into the peritoneal cavity. The operator, aware of this danger, may resect intestine, which is right, but adds to immediate risks. Oozing from broad adhesions is specially perilous; in Olshausen's hæmorrhage case, which died within twenty-four hours, diffuse putrid peritonitis had already developed.

Cures due to Operation. — Thirty-four of the remaining seventy-two suffered from recurrence; only two of the thirty-four living when last reported. Of the thirty-two traced to their death, one, a malignant cystic adenoma, lived two and a half years. Life was prolonged to within one and a half years in the cases of one sarcoma, one malignant adenoma, three malignant papilloma, and one carcinoma. Five cases of malignant adenoma and one carcinoma lived to within one year. The remainder died within six months—one sarcoma, four malignant adenoma, seven malignant papilloma, and six carcinoma.

There remain thirty-eight cases, of which thirty-six seem to have been traced. Five are set aside as dying of intercurrent diseases, leaving no less than thirty-one free for over five years from recurrence. The longest periods of immunity are—fourteen years seven months (case of carcino-sarcoma); thirteen years (one sarcoma, one malignant papilloma); ten years (one malignant adenoma); six years five months (one fibro-sarcoma); and five years eight months (one solid carcinoma). Let it be noted that "malignant" papilloma proves least malignant, according to these statistics. No less than seven come under the thirty-one cures. On the other hand, only one out of eighteen pure cancers remained free from disease.

The length or shortness of the pedicle is very important in respect to recurrence. Neither Kratzenstein nor any other observer has duly considered this matter. It is not enough to register cases as "pedunculated" or "sessile." Thus, in the case of a common glandular cyst with a short pedicle, the operator may leave a portion of its base in the stump. That portion is apt to undergo malignant degeneration. Cystic tumours of the ovary, whether malignant or innocent, often have a good, true pedicle; true or normal as consisting of tube, mesosalpinx and ovarian ligament, and good as being healthy in tissue, yet greatly hypertrophied, so as to facilitate

and render safe ligature and division close to the uterus. On the other hand, in solid tumours it is remarkable how often there is a true pedicle very short and small. Such a pedicle, when the tumour is malignant, is unfavourable as to freedom from recurrence.

Ascites is no proof of malignancy. In pure fibroma of the ovary it is frequent, in uterine fibro-myoma it is rare. It is not invariable in the worst forms of solid or semi-solid ovarian tumours, whilst in papilloma it is rarely, if ever, absent. The malignancy of a papilloma can only be proved by the after history. It is, however, the ascites of fibroma that must have induced observers to class an innocent tumour as malignant and non-recurrent. In a soft and œdematous fibroma abundant connective tissue between the bundles of fibres is often taken for sarcoma. I have published some observations on the after histories of these sham sarcomata ("Cases of Fibroma of the Ovary and Ovarian Ligament." *Trans. Obstet. Soc.* vol. xxxviii. p. 187). Several of the cases which I tabulated were reported as undoubtedly malignant, but were living free from recurrence several years after the operation. Re-examination of sections explained the fallacy which I noted above.

Malignant tumour of the ovary is prone to become bilateral. Almost symmetrical sarcoma is not unknown; more frequently one ovary has become converted into a large tumour before its fellow, already invaded, has reached double the normal size. A uniform brace of papillomatous tumours is not uncommon. Von Velits, on the strength of his statistics, writes: "In order to prevent the necessity for a second ovariotomy we must, after the extirpation of an evidently malignant tumour, also remove the other ovary, though it may possibly seem healthy" (*Zeitsch. f. Geburtsh. und Gynäk.* vol. xx. p. 384). As innocent ovarian tumours tend to undergo malignant degeneration in middle life, Pfannenstiel goes so far as to urge the amputation of the opposite ovary, however healthy it may appear, in any ovariotomy for ordinary cystic tumour in a patient over forty. This is an extreme practice, but I always sacrifice the fellow to a papilloma if it show the least sign of grittiness on the surface, or any other abnormality.

I have succeeded in tracing eight cases where I performed ovariotomy for evident malignant disease between 1890 and 1896, following more or less the details above recapitulated.

About eight more could not be traced; besides, I have rejected a large number of cases where the tumour was a papilloma of questionable malignancy, removed entire, without history of recurrence, or a tumour of a similar type clinically malignant, having spread too far over the peritoneum to be removed entire. The freedom from recurrence in at least two of the latter type proves that the papilloma was not pathologically malignant, the growths left behind tending to wither if the main tumour be removed; in any case the latter, if left behind, would certainly have killed the patient. I also have set aside all cystic adenomata not clearly malignant.

Of the eight pathologically malignant tumours, three were true adeno-sarcomata. One enjoyed perfect health for fifteen months, then recurrence occurred and proved fatal twenty-two months after the operation. One died six months after the operation from hemiplegia, but without signs of recurrence. She was paralysed two years before the operation. The third was well six years after operation, when I removed the left breast, the seat of a scirrhous cancer. Three were cases of malignant papilloma. In two the pedicles were good, in the sense already explained; both patients were well two years after ovariotomy; henceforward neither could be traced. In one the disease was bilateral and the pedicles normal but very short; recurrence occurred in about four months, the patient dying two months later. There remain one case of almost solid mixed sarcoma, free from recurrence three years later, and one of cylindrical-celled sarcoma, ill at the time of operation, but in good health for five months after convalescence, when suddenly jaundice set in, with ascites; death followed within two months. I have operated on several malignant cases since 1896, still living. Three cases died of the operation, in one a cystic sarcoma and one a cystic adenoma; there were intimate adhesions to small as well as large intestine, and resection was impracticable, though damage to the serous coat of the gut was repaired as well as possible. The remaining case was a very soft and rapidly-growing columnar carcinoma; the anterior part of the outer wall intimately adhered to the peritoneum of the bladder and right iliac fossa. Perfect separation was impossible, and the operation was thus in a certain sense incomplete. The special dangers of ovariotomy for malignant disease are well known, and any one case may prove fatal; but, as Greig Smith

said, operating on bad cases saves patients though it ruins statistics.

Are patients who are not cured benefited by operation?—The reply to this question is clear. After incomplete operations the patient is in far greater misery than before, whilst if all the tumour can be removed, the discomforts due to its presence cease and the patient will enjoy a few months of comfort.

Recurrent disease, unless limited to the remaining ovary, is beyond the reach of operation. The surgeon must never scruple to remove a second ovarian tumour, on the false ground that as the first was suspicious so the second may be hopelessly malignant. I once removed a very ugly looking papillomatous tumour from a woman aged fifty. Five years later I removed the opposite ovary converted into a similar, but yet more suspicious looking papillomatous tumour; the clinical appearances were very unpromising. The patient is yet alive and well, nearly five years after the operation. "Judicious selection" would have sacrificed this case, though acting on that principle I should not have lost the three above noted.

Conclusions.—From the evidence which has been adduced, I think that the following conclusions are justified.

That malignant disease of the ovary, of whatever kind, should be treated by operation on the same principles as are applied to the surgical treatment of malignant disease of other parts of the body.

That there is special risk in removing a malignant ovarian tumour, and that complications relatively trifling when such tumours are innocent become grave when they are malignant.

That the surgeon must not on that account hesitate to operate at the earliest possible period in cases of suspected malignant disease.

That the first steps of the operation should in all cases be exploratory, with a view to discover the extent and circumstances of the disease.

If the disease be found circumscribed and not too intimately adherent to the surrounding structures, it should be removed, and the removal will be attended by a good prospect of recovery, a fair chance of at least a few months of comfort, and a small prospect of permanent success.

If, on the other hand, the tumour has infiltrated the broad ligament or is intimately adherent to important neighbouring

structures which must be seriously injured in the attempt to remove it, or is associated with affection of the lymphatic glands or other secondary growths, the attempt at removal should not be made.

As some innocent solid tumours have been described as malignant, so some malignant tumours have been removed under the impression that they were innocent. Of the results of such operations we have no means of judging, but it may be inferred that the good results in the former class have served to mislead us, making us think that sarcoma of the ovary is less malignant than sarcoma elsewhere. In the second case, as the innocent appearance of the tumours must necessarily signify that the malignant disease was in an early stage, such operations were most probably among the most successful undertaken for malignant tumour of the ovary.

Fallopian Tube

Primary Cancer of the Tube.—Since Orthmann published, in 1888, the first undoubtedly genuine case of primary cancer of the tube, many more have been described. In the tables which I prepared in May 1898 (*Trans. Obstet. Soc.* vol. xl.) twenty-five cases are recorded. Most cases of secondary cancer of the tube are easy to distinguish from the primary form. In secondary cancer, malignant deposit is usually seen studding the serous coat of an undilated tube attached to a cancerous ovary, and so it is in sarcoma. The case is different when a dilated tube is associated with an ovary the seat of primary cancer. Some malignant growth may find its way into the tube. This condition must be remembered by the operator before he reports a case of tubal cancer, or sarcoma, as primary.

Primary cancer of the tube is intimately associated with papilloma of that duct, which is in turn closely allied to inflammation of the tubal mucous membrane. Doléris and Macrez seem right in speaking of the innocent growth as "papillome endo-salpingitique." In 1879 Spencer Wells removed a papilloma of the tube from a middle-aged woman subject to pelvic inflammation. There was much ascites due to escape of irritating discharge from the growth out of the open ostium of the tube, and in other respects the case seemed malignant. Yet the patient was living in 1897. On the

other hand, Kaltenbach removed both tubes, also from a middle-aged woman. They were the seat of a primary growth which was examined with great care and found to be an innocent papilloma. In no part of the tumour was any invasion of the stroma of the papillæ by the epithelium detected, whilst in some parts the earliest condition of the growth, a papilla springing from the mucosa, was clearly manifest. Yet recurrence took place within eighteen months. No doubt some papillomatous mass left behind underwent cancerous degeneration—a pathological change very familiar elsewhere.

A primary cancer of the tube is at first very like a papilloma, but later on it becomes a medullary mass and loses its papillomatous aspect. The clinical history usually indicates that symptoms of pelvic inflammation have been present for some years, that a pelvic tumour has more recently developed, and that a watery, often sanious, discharge escapes from the uterus, itself free from disease. The discharge is absent when the uterine end of the tube is blocked. With one exception only, all the twenty-five cases in my tables were over forty, and, with two exceptions, including the most doubtful case in the whole series, all were under sixty. In the exceptionally young case, the patient was thirty-six; in that instance cancer had developed in a pyo-salpinx, so that there must have been long-standing local inflammation, as usual in this disease.

Of the twenty-five cases of cancer in the tables, three represented a sub-class where the new growth lay mostly in a cyst connected with the ostium. Most probably an old hydrosalpinx is meant; all three were above the average age. Two underwent operation and recovered. The after histories are too short to be of the least value.

All the twenty-two cases of cancer in an apparently natural tube were treated surgically. Two died of the operation, one on the sixth day, one three weeks afterwards from intestinal obstruction. In fifteen the diseased tube and ovary were removed, in several instances it is more than probable that the cancerous tube was not entirely excised. In seven the uterus as well was removed: by abdominal section in four, by vaginal hysterectomy in three. These more complete operations are the better surgery. All seven recovered. Of the four abdominal cases, one lived for about a year and a half and one died

from recurrence in about seven months. In the first case the adjacent parts, as well as the removed uterus and ovaries, were found healthy at the operation. In the second the intestines already seemed infected by adhesions. The two others were incomplete operations. Of the three vaginal cases, one died of recurrence within seven months and two have no after history. Out of the fifteen cases where the diseased tube was simply removed, with its ovary, two died of the operation, as above related. Of the thirteen that recovered, one was free from recurrence seven years afterwards, one a year and seven months, one a year and two months, and one a year. These four recoveries justify operation when we remember what non-interference would mean. Two cases have no reliable after-history, leaving seven where recurrence was noted between two and eighteen months. Since I prepared the tables above noted, several more authentic cases of primary tubal cancer have been reported by Macrez, Danel of Lille, and Friedenheim.

Primary Sarcoma of the Tube.—This disease is very rare, and out of three authentic cases submitted to operation two died from immediate results, one from recurrence eight months later.

Treatment.—For reasons above explained, an old dilated Fallopian tube is a source of danger. Hence, when the surgeon makes an exploratory incision in a case of obscure pelvic swelling in a middle-aged woman and finds a tube in this condition, it should be removed. A papillomatous tube must always be cut away; indeed, it cannot be distinguished from cancer by the naked eye. When malignant disease of the tube is evident or strongly suspected, supra-vaginal hysterectomy is usually the safer course, especially if both tubes be involved. Vaginal hysterectomy is less suitable, as it does not permit of free exploration of neighbouring viscera to see if the cancer has extended. In that complication, as revealed by an abdominal section, any further procedure is useless, or if only a small deposit be discovered it may be excised from intestine or peritoneum and the tube removed, with or without the uterus as seems advisable.

CHAPTER XXXII

BREAST

THE breast is subject to many different varieties of malignant tumour; but some of these, the myxomas and colloid carcinomas, are of rare occurrence, while others, the hard and soft carcinomas and the sarcomas, are so common that they naturally absorb the attention of those interested in the results of operative surgery. For our purpose it is not needful to describe the different varieties of sarcoma or even the hard and soft carcinomas separately.

Again, although the male breast is subject to the same kind of tumours as the female breast, the number of cases occurring in males is so small in comparison with the number occurring in females that the male cases may be left out of the consideration.

Sarcoma, of whatever variety, attacks the breasts of adult women almost invariably, yet cases are on record in which young girls or even children have been victims of the disease. Further, women beyond thirty and forty years of age are more liable to sarcoma than younger women. The tumour often commences in the same manner, and bears exactly the same characters, as an innocent fibrous tumour. It is at first perfectly circumscribed, very freely movable, not adherent even to the mammary gland. It is usually a nodular or tuberose, firm tumour, perhaps rather less firm than a fibrous tumour. There is no retraction of the nipple, no dimpling of the skin. The rate of growth is in the beginning not more rapid than that of many fibrous tumours, but, on the other hand, some of the sarcomas grow from the first with great rapidity, and are recognised chiefly by the rapidity of their growth. If the tumour contains no cysts, it may retain the characters which it first presented, and, even though it attains a considerable size, may be independent of the skin, the muscle, and even of

the mammary gland. In this condition it may be removed, and even then, until a microscopical examination has been made, may be mistaken for an innocent growth ; for most sarcomas are, in their first appearance, encapsuled, and many of them present on section the aspect of a simple fibrous tumour. Although the removal of the tumour is, so far as can be told, perfectly performed—indeed, it shells out easily in its capsule —yet within a few months or a year a second growth slowly forms near the scar of the operation. The recurrent growth differs from the primary tumour in some important respects : it is not so circumscribed, or, if it be so, is not nearly so freely movable ; it is often visibly adherent to the skin at or near the scar, and is seldom so separable from the mammary gland. It usually grows more rapidly than the primary disease, and may in a short time form a mass of considerable size. Nevertheless, it may be easy to remove it, for it is easy to distinguish the substance of the tumour from the normal structures, and not difficult to dissect it out, although there is now no capsule, as there was to the primary tumour. The adherent skin is of course removed with the growth, and the same precaution is employed in the management of all other structures which are in the least degree suspect. Yet, after a longer or shorter period, there is a third formation of sarcoma, which may resemble the second growth, or may be even more menacing. In all probability the entire breast is now removed, or perhaps this was done in the removal of the second tumour, and by this means a further development of sarcoma may be averted. But this is not by any means certain ; recurrence may follow recurrence until the infiltration of many and deeply seated parts—the penetration of the chest-wall, for example—may render any further operation impossible, and the patient at length dies, worn out by the suppuration of an ulcerated mass. In all this formation and re-formation of sarcomatous disease, it must be noted that there is very seldom, and as if only by accident, affection of the axillary or cervical lymphatic glands. There may, on the other hand, be secondary disease of one or more of the internal organs or distant parts of the body, for dissemination is not uncommon.

In women after forty years of age, mammary sarcomata frequently contain cysts, and, within the cysts, intra-cystic growths ; and although these conditions produce marked and

curious effects on the course of the disease in the breast, they do not alter in the least degree its essential nature. The primary disease usually enlarges much more rapidly than the sarcomas which contain no cysts, and the surface of the tumour may present large and numerous fluctuating bosses. In the course of time, one or more of these bosses may cease to fluctuate, may assume much more threatening characters than previously, may give way and extrude a bleeding fungous mass —the intra-cystic growth which it contained. Proliferous cystic sarcomas, particularly those which are thus ulcerated and fungating, present a much more formidable aspect than the non-cystic tumours, and, in consequence, the first removal of the tumour is much more likely to be very free. They recur, however, in the same manner as the non-cystic tumours, gradually affect the deeper structures, and in time kill in the same manner, by suppuration or by the formation of secondary tumours ; but the lymphatic glands are not more liable to be diseased than in the case of the sarcomas which are not cystic.

The duration of life of women affected by sarcoma of the breast varies within the widest limits : it is seldom less than a year, and much more likely to be several years, while cases are on record in which recurrent tumours have been removed as many as fifteen or twenty times in the course of many years.

Carcinoma is, even more than sarcoma, a disease of adult life, rarely occurring in persons under thirty years of age, and becoming much more frequent after forty years are passed. During the past ten years the manner of extension of the primary tumour and the dissemination of the disease have been carefully studied by several observers on the Continent and in Great Britain, and we are now in a much better position to deal with it than we were when the last edition of this book was published.

The ordinary hard tumour, which may, notwithstanding its hardness, present to the microscope the large alveoli and numerous cells of medullary carcinoma, commences as an indurated nodule in some part of the mammary gland, with which it is from the first so intimately connected (being, indeed, to all intents merely a transformed portion of the gland) that it cannot be moved separately from it. Yet its mobility may be very considerable, for the gland itself is very freely movable in

the fat beneath the skin and over the pectoral muscle. It is only when an attempt is made to move the tumour apart from the gland that the two are found to be inseparable. The nodule is not so clearly defined and circumscribed as a sarcoma or a fibrous tumour; nor is it encapsuled. It increases in size, often with rapidity, but the rate of growth is very variable; and, with its enlargement, it becomes slowly adherent to the integument and to the pectoral muscle. The first intimation of attachment to the skin is a slight dimpling over the tumour, but in the course of time the new growth and skin become so closely fixed together that it is impossible to separate them, and the skin is distinctly infiltrated by the cancer. If the disease is left to itself, ulceration may take place, with the formation of a deep foul cavity which appears to be dug out of the new growth. The nipple is often retracted, and the integument for some distance around the tumour may be the seat of numerous nodules or plaques set in the skin and subcutaneous tissue.

Usually, within a few months of the first appearance of the tumour in the breast the lymphatic glands in the axilla become enlarged, but the glandular affection may be deferred for a very much longer period, and may not occur for two, three, or more years. Indeed, there are cases on record in which the primary disease has been in existence for as many as ten or more years without any obvious enlargement of the axillary glands. Such cases are, of course, remarkable exceptions to the general rule. In addition to the glands in the axilla, those beneath the clavicle and those in the neck may become enlarged and cancerous. Secondary tumours may form in the liver, the lungs, and other internal organs, as well as in the bones, particularly those of the spine.

In some rare instances both breasts are simultaneously affected; but more often one of them is attacked long after the other has been the seat of cancer.

The cause of death in carcinoma of the breast may be exhaustion from ulceration and hæmorrhage, or the formation of secondary deposits; or the primary tumour may extend into the pleural cavity and produce pleurisy, with effusion, &c. The duration of life without operation may be roughly estimated at from two to three years.

In considering carcinoma of the breast from the operative

point of view, it is essential to bear in mind: (1) That even when the primary disease takes the form of a compact mass, and appears on section to be circumscribed, it is apt to be disseminated widely throughout the whole of the breast-region, probably in the form of tiny emboli in the lymphatics of the mammary gland and circum-mammary fat; (2) that it has a remarkable tendency to spread backwards to the pectoral fascia, even when its posterior border seems to be clearly defined and at some distance from the fascia, again in the form of microscopic masses or emboli; (3) that when the tumour is adherent to the fascia, the muscle often is the seat of microscopic cancer masses; (4) that the glands above the pectoralis minor may be earlier and more seriously affected than those in the lower part of the axilla, although this is comparatively rarely the case.

It is necessary to modify the above description to meet the case of certain varieties of cancer of the breast.

For practical purposes, *colloid carcinoma* and *duct carcinoma* may be considered together. They both occur in women at about the same age and under precisely the same conditions as the ordinary hard carcinoma. But they are much slower in affecting the lymphatic glands, and may recur several times in the breast or exist for several years before they do so. They differ in one respect: colloid carcinoma may, in the course of many years, produce secondary growths in various and distant parts of the body: duct cancer appears to do this very rarely indeed, if ever. Gross estimates the duration of life in colloid cancer as twelve years instead of the two or three years which is the average duration of cases of ordinary carcinoma of the breast. Although we have not so much information yet on the subject of duct carcinoma, it will probably be safe to estimate the duration of life at quite as long as in cases of colloid carcinoma.

From the surgical point of view, I do not know that there is any reason for separating the cases of *atrophying scirrhous* from those of the common form of hard carcinoma. They run essentially the same course, but the atrophying cancers are very slow in their progress, affect the glands rather late, and distant parts of the body still later, so that the natural duration of the disease is probably about four years. What relation this variety of cancer bears to the common variety of hard carcinoma,

I am not certainly able to say, and I do not know any good account of the precise pathology of the disease. In 1880, S. W. Gross of Philadelphia came to the conclusion that operation on atrophying cancer is more harmful than useful, and that the patient is likely to live longer and more comfortably if no operation is performed. I could not then say how far this conclusion was justified. But I think I may now say that those cases of cancer which appear to be atrophying cancer in a tolerably early condition are not bad cases for operation. On the other hand, when the disease is fixed down tightly to the wall of the chest, and there are hard and fixed glands in the axilla, operation is hopeless. I suspect that Gross's dictum referred to the disease in that condition.

Methods of Operation.—The only operations which are applicable to the removal of malignant disease of the breast are: (1) Amputation of the breast; (2) amputation of the breast and the complete removal of the entire contents of the axilla. The mere removal of the tumour ought never to be practised, even in cases of sarcoma, unless there is some very urgent reason for limiting the operation. The wound usually heals as well or better when the entire breast is removed.

1. *Amputation of the Breast.*—Amputation of the breast is applicable to cases of sarcoma and would suffice for most cases of duct carcinoma, if the nature of the disease were obvious. It is also sometimes practised on very old or very feeble persons who are not strong enough to bear the large operations for carcinoma which are now performed. And, again, the breast alone may be removed for palliative reasons, when there is inoperable disease of the lymphatic glands. The part having been prepared in the manner described in the next section, the surgeon stands on the same side as the affected breast, and his assistant on the opposite side of the table. The arm is drawn away from the chest and kept away during the operation. The tumour should generally occupy the centre of the area of integument which is removed, and this may and generally does include the nipple and areola, although it is sometimes convenient, in cases of sarcoma, and in the case of very old people, to leave them to avoid a large open wound. As large an area of integument as can be spared is removed between two elliptical incisions, which are usually made to run diagonally upwards towards the axilla. The skin and subcutaneous tissue

are divided, and the dissection is carried around the lower part of the gland, so as to separate it first from the skin flap and from the pectoral muscle. The fascia should be removed and even a layer of the pectoral muscle itself, if the tumour lies near it. The dissection is then commenced from the upper side, and carried round in a similar manner until the two dissections meet. Wells's clamp-forceps are applied to the vessels as they are cut, and they are afterwards tied or twisted. When the hæmorrhage has ceased, the wound is swabbed out, and the edges of the skin are brought together by sutures of fine silk or silkworm-gut. Drainage is rarely required, and the wound is usually healed and the patient well in the course of a few days. The dressings seldom require to be changed until the stitches are removed, a week or ten days after the operation. It is then well to apply a narrow strip of gauze along the line of the scar, and to keep it in place by several broad long strips of strapping, in order to protect the newly-healed part and to prevent the edges of the wound from being torn apart by accident. At the end of a fortnight, the strapping may be removed, and is not likely to need to be replaced.

Removal by Caustics.—It is many years since I have employed caustics for the removal of a tumour of the breast. They were formerly used from time to time by surgeons of the highest standing for the treatment of cancer of the breast in very old or feeble persons. But the vast improvements which have taken place in surgery render it less and less likely that they will be resorted to in the future.

I hope, then, it will suffice to refer those who are interested in the subject to the first edition of this work or to a paper in the twenty-third volume of the St. Bartholomew's Hospital Reports (1887), page 57, where a detailed account of the method of applying Vienna paste and Bougard's paste will be found.

2. *Amputation of the Breast and complete removal of the contents of the Axilla.*—There is now a general agreement among surgeons who are frequently in the habit of operating for cancer of the breast that the breast and the entire contents of the axilla should be removed in every case, unless there are very special indications to the contrary. And the only question on which there is discussion is, What is the method of operating which is likely to remove the disease in such a

manner that it shall not recur *in situ?* To be complete, the operator should remove the entire breast (as we now understand it), and the circum-mammary fat, a large area of integument, including the nipple and areola (in order to clear away the sub-areolar plexus of lymphatics), the pectoral fascia and a part, at least, of the greater pectoral muscle, the entire contents of the axilla, and the tissues intervening between the breast and the axillary glands. For my own part, while I think that Volkmann's operation and that described by Cheyne ("The Objects and Limits of Operations for Cancer," page 24) are very thorough and sufficient for many cases, I am strongly of opinion that no operation so completely meets the necessities of most of the cases as that designed by Halsted ("Annals of Surgery," vol. xx. page 497, November, 1894). It ensures the removal of the pectoral fascia, and clears away the tissues beneath the greater pectoral muscle, and opens up that part of the axilla which lies immediately beneath the clavicle in a manner which is not effected by any other operation. In those cases in which the glands above the pectoralis minor are chiefly affected, this is of great importance. And Halsted's method of removing the contents of the axilla by dissection, not by tearing them out, is also very desirable.

Since the beginning of 1895 I have made this my routine operation, although I did not dare to perform it so invariably at first as I have done since. As the author lays great stress on the details, I shall give the account of the operation in his own words, and shall illustrate the description with copies of his own illustrations:

(1.) The skin incision is carried at once and everywhere through the fat.

(2.) The triangular flap of skin (Plate 11) is reflected back to its base line. There is nothing but skin in this flap. The fat which lined it is dissected back to the lower edge of the pectoralis major muscle, where it is continuous with the fat of the axilla.

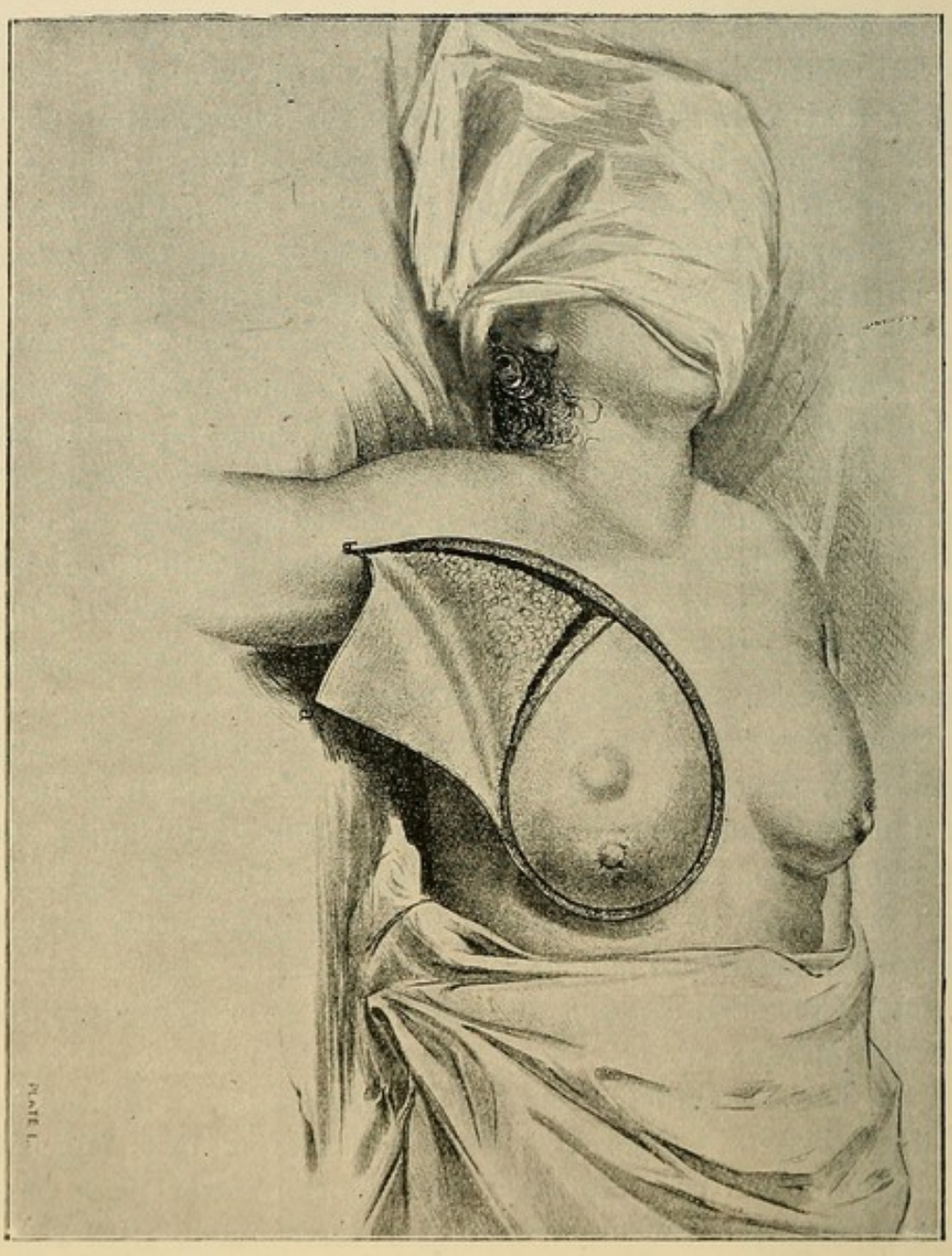
(3.) The costal insertions of the pectoralis major muscle are severed, and the splitting of the muscle, usually between its clavicular and costal portions, is begun, and continued to a point about opposite the scalenus tubercle on the clavicle.

(4.) At this point the clavicular portion of the pectoralis major muscle and the skin overlying it are cut through

hard up to the clavicle. This cut exposes the apex of the axilla.

(5.) The loose tissue under the clavicular portion (the portion usually left behind) of the pectoralis major is carefully

FIG. 11

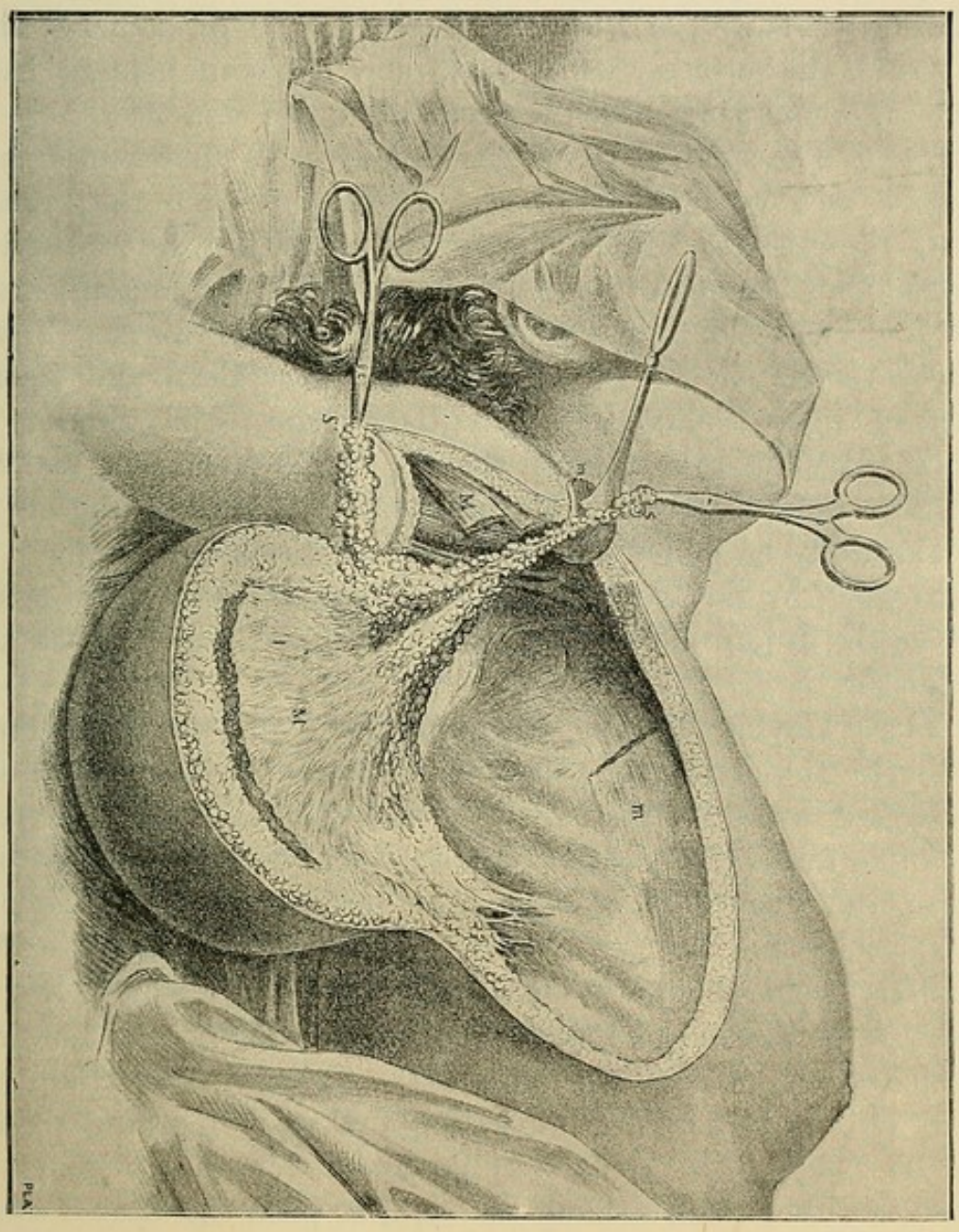


dissected from this muscle as the latter is drawn up by a broad, sharp retractor. This tissue is rich in lymphatics, and is sometimes infiltrated with cancer (an important fact).

(6.) The splitting of the muscle is continued out to the humerus, and the part of the muscle to be removed is now cut through close to its humeral attachment.

(7.) The whole mass, skin, breast, areolar tissue, and fat, circumscribed by the original skin incision, is raised up with some force, to put the sub-muscular fascia on the stretch as it is stripped from the thorax close to the ribs and pectoralis minor

FIG. 12



muscle. It is well to include the delicate sheath of the minor muscle when this is practicable.

(8.) The lower outer border of the minor muscle having been passed and clearly exposed, this muscle is divided at right angles to its fibres, and at a point a little below its middle.

(9.) The tissue, more or less rich in lymphatics, and often cancerous, over the minor muscle near its coracoid insertion is divided as far out as possible, and then reflected inward in order to liberate or prepare for the reflection upward of this part of the minor muscle.

(10.) The upper outer portion of the minor muscle is drawn upward (Plate 12) with a broad, sharp retractor. This liberates the retractor which until now has been holding back the clavicular portion of the pectoralis major muscle.

(11.) The small blood-vessels (chiefly veins) under the minor muscle near its insertion must be separated from the muscle with the greatest care. These are imbedded in loose connective tissue which seems to be rich in lymphatics, and contains more or less fat. This fat is often infiltrated with cancer. These blood-vessels should be dissected out very clean, and immediately ligated close to the axillary vein. The ligation of these very delicate vessels should not be postponed, for the clamps occluding them might of their own weight drop off or accidentally be pulled off; or the vessels themselves might be torn away by the clamps. Furthermore, the clamps, so many of them, if left on the veins, would be in the way of the operator.

(12.) Having exposed the subclavian vein at the highest possible sub-clavicular point, the contents of the axilla are dissected away with scrupulous care, also with the sharpest possible knife. The glands and fat should not be pulled out with the fingers, as advised, I am sorry to say, in modern text-books and as practised very often by operators. The axillary vein should be stripped absolutely clean. Not a particle of extraneous tissue should be included in the ligatures which are applied to the branches, sometimes very minute, of the axillary vessels. In liberating the vein from the tissues to be removed, it is best to push the vein away from the tissues rather than, holding the vein, to push the tissues away from it. It may not always be necessary to expose the artery, but I think that it is well to do this. For sometimes, not usually, the tissue above the large vessels is infiltrated. And we should not trust our eyes and fingers to decide this point. It is best to err on the safe side and to remove in all cases the loose tissue above the vessels and about the axillary plexus of nerves.

(13.) Having cleaned the vessels, we may proceed more rapidly to strip the axillary contents from the inner wall of the axilla, the lateral wall of the thorax. We must grasp the mass to be removed firmly with the left hand, and pull it outward and slightly upward with sufficient force to put on the stretch the delicate fascia which still binds it to the chest. This fascia is cut away close to the ribs and serratus magnus muscle.

(14.) When we have reached the junction of the posterior and lateral walls of the axilla, or a little sooner, an assistant takes hold of the triangular flap of skin and draws it outward, to assist in spreading out the tissues which lie on the subscapularis, teres major, and latissimus dorsi muscles. The operator having taken a different hold of the tumour, cleans from within outward the posterior wall of the axilla. Proceeding in this way we make easy and bloodless a part of the operation which used to be troublesome and bloody. The subscapular vessels become nicely exposed and caught before they are divided. The subscapular nerves may or may not be removed, at the discretion of the operator. Kuster lays great stress upon the importance of these nerves for the subsequent usefulness of the arm. We have not as yet decided this point to our entire satisfaction, but I think that they may often be spared to the patient with safety.

(15.) Having passed these nerves, the operator has only to turn the mass back to its normal position, and to sever its connection with the body of the patient by a stroke of the knife, repeating the first cut through the skin.

My own experience of this operation is, as I shall presently show, very satisfactory. I have performed it sufficiently often to be conscious that it is a very severe proceeding, and that the patient suffers from bad shock for some hours. In order to minimise the risk, Halsted's directions with regard to the careful arrest of hæmorrhage at every step of the operation should be strictly observed. I have not attempted to spare the subscapular nerves, and I have been surprised to find that the movement of the upper extremity is remarkably good, provided too large an area of the integument has not been taken away.

All my breast operations have been performed by the antiseptic, not by the aseptic method, as I find the former much

easier to carry out with success in a general hospital, where suppurating cases are always present in the wards. And as it is simpler to adopt the same method for all cases of the same class, my private operations have been performed by the same method. The condition of the liver, kidneys, and heart should be ascertained, and special care should be taken if the patient is subject to bronchitis, for the operation lasts more than an hour. Ether is generally administered at first, then chloroform. But if the patient is bronchitic, ether is only very sparingly employed. The integument is prepared on the previous evening. The hair is cleared out of the axilla, the entire breast region washed with warm water and soap very thoroughly, then with a little pure ether, then covered with blue gauze or cyanide gauze, soaked in one in sixty to one in forty carbolic lotion. Over this dressing a piece of gutta-percha tissue is placed. The dressing is left on until the operation, if this is performed in the early morning, but is renewed the next morning if the operation does not take place until the afternoon. The instruments, which have been boiled, are placed in trays containing a solution of one in forty carbolic lotion. The ligatures, which are of silk or catgut, and the sutures, which are of silk (carefully boiled for about half an hour), are kept in similar lotion. Both my assistant and I are very careful in the preparation of our hands, scrubbing them for several minutes with soap and warm water, then rubbing into them (one in five hundred) solution of bicyanide of mercury, with which a small quantity of glycerine has been mixed. The area of operation is surrounded by towels which have been sterilised in a steam steriliser. The shoulders are raised upon a pillow, the head thrown back, and the arm drawn out from the side in the usual manner.

The greatest care should be exercised in all the details connected with the preparation of the patient, the hands of the operator, the instruments, &c., for these large breast wounds are very prone to suppurate if there is the smallest defect in the method. In place of natural sponges I usually employ blue mercurial wool, washed out in warm carbolic lotion, one in sixty. If the axilla is deep I generally insert a drainage tube; but if it is shallow the tube is not needed. The wound is powdered over with iodoform, after its edges have been drawn together, and is then covered with a layer of blue gauze,

soaked in one in forty carbolic lotion and with many layers of dry blue gauze, then with a great jacket of boracic wool inside a layer of pink waterproof jaconet.

If a drainage-tube has been inserted the dressings are generally changed, and the tube is removed two days after the operation. A week later they are changed again and the stitches are removed. This routine is of course varied if the case should need more frequent dressing.

In many cases in which a very large area of skin has been removed, I have turned up flaps from the skin of the side or abdomen, which have served to fill in the vacant space, and allow the wound to heal by the first intention. Other surgeons have used Thiersch's method of grafting a few days after the operation, if it has not been possible to bring the edges of the skin together. The loss of skin at a distance from the axilla, and low down, is not a serious matter; the nearer to the axilla, and the higher up, the more serious is the loss of skin, for it involves considerable restriction of the movement of the arm. In order to guard as far as possible against this, the triangular flap of skin is carefully placed in the axilla and fixed there, to ensure a good skin-covering for the axilla. The arm is only bound to the side of the chest for a couple of days, after which it is released, and the patient is allowed to move it gently and within limits. By these means the recovery of the use of the arm is earlier and more complete than when the arm is long fixed to the side of the chest.

I have not been in the habit of removing the supra-clavicular glands, certainly not as a routine part of the operation for cancer of the breast. The operations which are now performed are so extensive that any addition to them is fraught with danger. If the glands above the clavicle are to be removed, I think it would be wiser to do this when the patient has recovered from the larger operation. If they are actually cancerous, I believe that the case is hopeless, so far as radical cure of the disease is concerned. And that is an opinion which is shared by most operators at the present time.

Operations for Recurrence of disease either in the region of the breast or in the axilla are frequently performed, and are sometimes very successful, chiefly in the cases of very slow-growing cancer, where the original disease developed very slowly, and where the glands were not at all, or very late,

affected. No general rule can be applied to such operations, save that they should include a very wide area of the tissues in the vicinity of the recurrent growth. If the first operation did not comprise the removal of the breast and axillary contents, I am in the habit of performing Halsted's operation for the recurrent disease. But it must always be kept in mind that operations for recurrent disease are not likely to be nearly so successful as operations for the original disease. The recurrence may take the form of a single tumour, but is much more likely to be diffused or to occur in the form of two or more separate and sometimes distant nodules. Of the very large operations which I have read or heard of from time to time, including the removal of half the clavicle and the whole of the upper extremity, I have had no personal experience, nor am I disposed to court it. If the disease, whether primary or recurrent, is so extensive as to call for such an operation, I believe there is not the least hope that it will effect a cure. I have not myself removed the upper extremity in cases in which it is enormously swollen from disease in the glands, but I can conceive that it is justifiable as a palliative measure.

Results of Operations.—*Mortality of Operations.*—In the last edition of this work I collected from various sources over 600 cases of operation for cancer of the breast, ranging from removal of the disease and its surroundings to extensive amputation of the breast and removal of the contents of the axilla. The mortality due to the operation was as nearly as possible sixteen per cent.; and the lowest rate of mortality in the hands of Lord Lister at that time was no less than eight per cent. My own rate of mortality was only five per cent., but I had not at that time performed so many large operations, comprising the entire removal of the breast and of the contents of the axilla. Setting aside what may be regarded in the light of accidents, an over-dose of morphia or an attack of fatal bronchitis a fortnight after the operation, the causes of death were for the most part shock or sepsis in one or other form. Of course, many of the operations were practised in the seventies; but even admitting this, the mortality seemed to me to be far larger than it ought to be. I ventured to express the opinion that a mortality of five per cent. was quite sufficient; and I am happy to be able to show not only that that percentage has been reached, but that there is every hope that it may be still further

lowered, perhaps to three per cent. or even two per cent. in the hands of experienced operators. I doubt whether the mortality of the large operations which are now practised can be reduced much lower than this, for loss of blood and shock must always follow on them, and accidents will sometimes occur, especially in hospital practice, where the after care of the patient must necessarily fall largely on the house-surgeon. In addition, a small margin must still be left for sepsis, even in the practice of the most careful surgeons, in those cases in which the cancer is actually ulcerated at the time of the operation. I have made many attempts to disinfect these ulcers before operating, but they have very generally failed, and very profuse suppuration has resulted from the operation.

My own results for operations practised from the year 1880 to the year 1895 inclusive, and not taking into the account the Halsted operations, were six deaths in 116 patients, or a mortality of just under five per cent. A complete statement of these results and of the causes of death has been lately published in the *St. Bartholomew's Hospital Reports* (vol. xxxiv. 1898), and more briefly in the *British Medical Journal* (1898, vol. ii.), so that I need not enter into them more fully here, especially as they are surpassed by the later results.

Of the mortality of the operations which have been practised since the year 1890 or 1892 I have not a large series of statistics. But there is quite sufficient evidence to show that it has been considerably reduced. Taking 144 cases in which the operation was performed by Professor Halsted, Mr. Watson Cheyne, and myself, and of which an account has been published in the "Annals of Surgery" (*loc. cit.*), the "Objects and Limits of Operations for Cancer" (London, 1896), and the Hospital Reports and *British Medical Journal* (*loc. cit.*), only two of the patients died of the operations, and both of them probably from loss of blood and shock. I should like to have added to these 144 the cases treated by Professor Helferich in the Greifswald Klinik ("*Ueber die heutige Prognose der Exstirpatio mammæ carcinomatosæ*," von K. Joerss, *Deutsche Zeitsch. f. Chir.* xliv. 101, 1897), but unfortunately they are not arranged conveniently for the purpose. In all, he appears to have performed what he calls a radical operation in ninety-eight cases from the year 1885 to the year 1893, with four deaths. But the operation was not performed on his present lines until about the year

1890, so that his results are divided into those of the earlier and later period. But I cannot discover whether, and what, deaths occurred during the second period. Again, Professor Helferich's operations for hopeless disease, in which the operation was regarded merely as a palliative measure, are not included, so that his statistics do not correspond sufficiently with those from which the above statistics are taken to be used with them.

Cures Effected by Operation.—As in regard to the mortality due to operation, so in regard to cures effected by it, I have a very different tale to tell to that I told ten or twelve years ago. On the large number of cases I collected at that time I was only able to show ten per cent. of cures, but I expressed the opinion that, if the untraced cases had been followed up, the percentage would much more probably reach twelve, or even as high as fifteen. Mitchell Banks had just succeeded in procuring a percentage of cures amounting to sixteen or even twenty. As his mortality amounted to about twelve per cent., I considered his operation to be unduly severe, and believed that as good results could be obtained by a far less extensive operation, provided the operation were better adapted to what was then regarded as the anatomy and course of the disease. In the last volume of the *St. Bartholomew's Hospital Reports* (1898) I have given an account of the work which I performed on the principles I then laid down. I need not do more here than give the summary of results. The tumour was taken as the centre of the disease, and little or no account was taken of the complete removal of the breast, unless the tumour corresponded with the centre of the breast. A wide area of integument and a very wide area of the apparently healthy tissues around the tumour were removed, and not only the pectoral fascia, but a portion or even the whole thickness of the muscle immediately beneath the tumour, were taken away. The axillary contents were cleared out if there was obvious affection of the glands, or if there was a suspicion that they were enlarged. But the axilla was not necessarily opened in every instance as a part of the routine of the operation. As I fully believed at that time, the results of this operation were more satisfactory than those of the larger routine operations of Banks and Gross, and I attribute this to the fact that a wider area of apparently healthy tissues was removed in *every* direction around the

tumour, than when so much attention was expended in taking away the entire mamma; that the pectoral muscle (and fascia) was more freely dealt with; and that a wider area of skin directly over the tumour was removed in my cases than in those in which the skin all over the mamma was cut away. On these lines I operated, in hospital and private practice, from 1880 to 1895 inclusive, on 116 patients, with the following results:—

Died of the operation	6
Not yet traced	3
Dead or alive, with local recurrence	51
Dead of cancer, without local recurrence	22
Dead of other cause within 3 years of operation	2
Dead of other cause more than 3 years after operation	3
Alive and well	29
Total	116

There are therefore thirty-two cases of patients who were alive and well or who had died of some other cause than cancer more than three years after the last operation; and this number must be compared, not with the total of 116, but with a total of 111, arrived at by deducting from the grand total three patients not yet traced and two patients who died of some other cause than cancer within three years of the last operation. The percentage of "cured" cases is therefore 28·9.

It is only during the course of the present year (1898) that my own results have been worked out, so that I had only a very imperfect knowledge of what had happened in the cases operated on in private practice, and really no knowledge of the later history of the hospital cases. My former house-surgeon, Mr. J. Preston Maxwell, undertook to search out the history of the hospital cases, and performed his work with such success that he discovered the further history of all but two of the patients. There is every reason to fear that one of the two is dead, but there is equal reason to believe that the other is alive and well, and discharging her duties as a servant in the south-east of London. Of my private patients, I traced all but one, so that the whole work has been very completely carried out. I have said elsewhere that I believe the results of operations for cancer would prove to be much better than is suspected if the patients were more carefully traced. My table

affords a proof of this, for the high percentage of cures is largely due to the discovery, in spite of grave difficulties, of patients who had long been lost sight of and who were believed to have died.

I should have been very well content with these results were it not that much greater things have been achieved since. In the early part of the year 1895 I began to perform Halsted's operation in the manner described in his paper (*loc. cit.*), and in the course of that year operated on thirteen patients by that method, so that there are thirteen patients whose cases may be tested on the three-years' limit. They were not selected cases. The disease was examined microscopically in every instance. In some of them the glands were, both to the naked eye and to the microscope, cancerous. The results are as follow :—

Died of the operation	1
Dead or living, with local recurrence	2
Dead of cancer, without local recurrence . . .	1
Alive and well	9
Total	13

The average of successful cases on this small series is therefore equal to nearly seventy per cent. But I have no hope that we shall, for the present at least, succeed in attaining such an excellent result. Although only one of my patients was suffering from a mild form of carcinoma (one case of "duct-cancer"), there is no doubt in my mind that this is a very fortunate series of operations. I am already sure my next series of thirteen cases will not yield an equally good result, but I am equally sure that the result is likely to be far better than I have ever previously obtained. There are not yet any large series of cases, but there is nevertheless a sufficient number to allow of the formation of an opinion on the possibilities of the future.

Taking only those cases to which the three-years' limit can be applied, there are eleven of them in Halsted's paper, twenty-one in Cheyne's paper, thirteen of my own, and twelve of Rotter's (*Berliner klin. Wochensch.* 1896, Nos. 4 and 5). I should like to have availed myself of Beck's cases, but only the abstract of his paper is within my reach (*Clinical Recorder*, October 1896). For reasons which I have already given I cannot use Helferich's cases, much as I should like to have

done so. Of the fifty-seven cases made up from the above materials, I find that

Died of the operation	2
Dead or living, with local recurrence	15
Dead of cancer, without local recurrence	7
Untraced	1
Dead of unknown cause	3
Dead of other cause than cancer more than 3 years after operation.	2
Alive and well	27
Total	57

The total must be reduced to fifty-three by the withdrawal of the untraced case and of the three cases in which the patients are said to have died of unknown cause, whether cancer or not, in order to bring the statistics into the same line as usual. And the two cases in which the patients died of other cause than cancer more than three years after the operation must be added to the twenty-seven cured cases, making a total of twenty-nine successful cases, and a percentage of more than fifty-four. Even admitting that the three patients who died of "unknown" cause really died of cancer, the percentage is more than fifty, and that is a percentage which I hope we may be able to attain even under present conditions.

If patients suffering from cancer of the breast and their medical men can be educated to hope for good results from early operations, and if the latter can be trained to detect cancer of the breast before it is adherent to the skin and associated with enlargement of the lymphatic glands, there is every reason to believe that a higher percentage than fifty would be reached by the routine employment of extensive operations properly adapted to the conditions and course of the disease.

Are persons who are not cured benefited by operation?—Of this there can be no doubt. Of course, an operation which cuts through a cancer and does not completely remove even one focus of the disease may do more harm than good. But the removal of the breast in cases in which the glands are beyond the reach of operation is frequently a great relief to the patient. In one instance I removed the left breast of a lady whose right breast I had some time previously removed, although the first operation had only been performed for palliation. The

second breast became so large and heavy that the patient begged to have it taken away. Speaking generally, it may be said that persons who die of internal cancer without recurrence in the region of the breast and axilla are relieved by operation; that the removal of large, pendulous, and heavy cancerous breasts is a relief, and of breasts which are the seat of ulcerated cancer, or which are very painful. But if the incision is likely to pass through or very close to the disease, the operation had better not be undertaken lest the distress of the operation be added to that of the cancer, without any or sufficient compensation.

In some cases of primary disease, and in cases of recurrent disease, in which the axillary glands are destroyed by cancer, with consequent enormous enlargement and weight of the upper extremity due to lymphatic obstruction, amputation in the region of the shoulder-joint has been performed for the relief of the patient. I have had no personal experience of the treatment, but it appears to have afforded relief in suitable cases. If it is performed, probably Berger's operation (*L'amputation du membre supérieur dans la contiguité du Tronc*, Paris, 1887) is best suited to the purpose. Mr. Dent speaks very favourably of it in the *Royal Medical and Chirurgical Transactions* (vol. lxxxi. 1898, p. 221), and says that the patient on whom he performed it was very much relieved during the few months she survived the operation. As the chief indication for removal of the upper extremity in such cases, he sets down "The certainty of relieving pain. Unless the pain were severe, indeed the predominant system, the operation would hardly be taken into serious consideration."

Operations for Recurrent Disease.—Such operations are sometimes singularly successful, although as a general rule little can be hoped from them. If a well-planned and well-executed operation, adapted to the removal of the primary disease and contents of the axilla, is followed by re-appearance of the disease, that in itself is an index of the obstinate character of the disease, and the first recurrence is likely to be speedily followed by other and more dangerous return of cancer. Still, unless there are very decided contra-indications to operation, recurrences should be removed with a very wide area of healthy tissues in every direction around the tumour. I have seen more than one excellent example in my own practice of

the desirability of such operations for recurrence, and similar examples may be culled from many books and papers on cancer of the breast.

Results of Operations for Sarcoma.—The largest and best collection of cases of sarcoma of the breast for study with which I am acquainted is that published in the *American Journal of the Medical Sciences* (July, 1887) by my late friend, Dr. Samuel W. Gross. The article is entitled "Sarcoma of the Female Breast," and is based upon a study of 156 cases. Dr. Gross has divided his cases according to the general classification of sarcoma, but has subdivided them according to various modifications which they present in their structure. The infrequency with which the axillary glands are affected may be judged by the fact that he was only able to find evidence of sarcomatous affection of them in three of the total number of 156 cases.

Gross followed up the further history of ninety-one cases with the following result:—

Alive and well less than 1 year after operation	4
Alive and well from 1 to 3 years after operation	11
Alive and well from 3 to 10 years after operation	17
Suffered from local recurrence only	42
Local recurrence with metastases	11
Metastases without local recurrence	6
Total	91

More than half the local recurrences took place within six months of the operation, and only four of them after two years, so that there is good reason to take a very hopeful view of the patients who were alive and well three years after operation.

Metastatic deposits were not observed in any of the giant-celled tumours, and were most frequent in association with round-celled sarcoma, thus following the general rule observed by the varieties of sarcoma in other parts of the body.

Two things are very evident from a study of the table: first, that sarcoma is much more amenable than carcinoma to operation; second, that it is exceedingly prone to recur *in situ*.

To say nothing of the fifteen patients who were alive and well at various periods within three years after the operation, there are seventeen who may be claimed as thoroughly suc-

cessful. And it must be remembered that all the operations were performed before the end of the year 1886, when the percentage of successful cases after operations for carcinoma of the breast was not more than ten or twelve. Unfortunately, I have no information of the nature and extent of the operation which was practised in any of the cases or of the relative success of different operations.

On the other hand, there was recurrence *in sitû* in fifty-three of the ninety-one cases, and it is probable that the operation would be followed by local recurrence in some of the patients who had only lately been treated, so that the proportion is more likely to be seventy per cent. than less. Seeing the relative benignity of the disease, and the successful results of many of the operations, one cannot but think that it would be easily possible to obtain very much better results by more extensive operations for the primary disease. Gross sums up the treatment thus: "The entire breast, along with any skin that may be invaded, must be extirpated, especial care being paid to the complete removal of every particle of paramammary fat and the fascia of the pectoral muscle, in which tissues experience shows that recurrence takes place." I would add to this the desirability of removing a good deal of the thickness of the pectoral muscle underneath and for some distance around the tumour. And, I believe, if these measures were carried out in every case, recurrence *in sitû* would become as rare as it is now common. One of the chief difficulties in carrying these measures into effect is the uncertainty regarding the nature of the disease in many cases of sarcoma. The primary tumour often looks quite innocent; and is enclosed in a capsule as thick and decided as that which contains a fibroma. It thus frequently happens that the surgeon is ignorant of the real nature of the growth until it has been examined with the microscope, by which time the wound of the operation is probably healed and the patient has ceased to be under his care.

Conclusions.—Carcinoma of the breast should be removed at the earliest possible period, unless there are very strong indications against an operation.

In all patients who appear fit to bear the operation, it should include a wide area of integument over the tumour, the entire breast and circum-mammary fat, the pectoral fascia and a great part, if not the entire thickness, of the pectoral

fascia, with the entire contents of the axilla up to the clavicle.

All these tissues should be removed in one continuous mass.

At present, Halsted's operation appears to be the best adapted to the purpose.

If the highest infra-clavicular glands are cancerous, those above the clavicle in the posterior triangle of the neck should be removed. Otherwise, it seems unnecessarily severe to remove the supra-clavicular glands.

Recurrent disease, whether in the mammary region or in the axilla, should be removed as soon as it appears, provided it is within the reach of removal; the prognosis is far more grave than for the removal of the primary disease so far as *cure* of the disease is concerned.

Extensive affection of the integument and fixation of the disease to the chest-wall contra-indicate operation. The same may be said of affection of the glands very high up in the axilla forming an immovable mass, and of affection of the glands above the clavicle.

Even in cases in which there are conditions which preclude all hope of a radical cure of the disease, the breast may sometimes be removed with advantage to the patient, particularly on account of ulceration or extreme pain.

Sarcomas should be treated by removal of the entire breast, a large area of the integument over the tumour, the fat around the mammary gland, the pectoral fascia, and a layer of the pectoral muscle beneath the tumour.

If, at the first removal, only the tumour has been removed owing to an error of diagnosis, the recurrent disease should be treated as freely as the primary disease would have been had the diagnosis of sarcoma been made.

Recurrent disease should be removed, with a wide area of the surrounding apparently healthy tissues in every direction; and the operation should be repeated as often as it is necessary, provided there is no sign of secondary disease.

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