The influence of the stage of the cancer on the risk of urinary infection is shown by the fact that among women 77 per cent. of the late cases became infected and only 59 per cent. of the early cases. Similarly, among men infections occurred in 42 per cent. of the late cases and in only 32 per cent. of the early cases (Fig. 4). The average age in each group was approximately the same, and it seems justifiable to attribute the increased incidence of urinary infection in the more advanced cases of cancer to a decline in general health.

FIG. 4.—Influence of the patient's general condition as shown by the frequency of post-operative urinary infections in early and late cases of cancer of the rectum.

These four factors—sex, age, duration of retention, and general health—are each responsible for considerable variation from the average in the incidence of *B. coli* infections after post-operative retention. The last three are to some extent dependent on each other, the duration of the retention being related to the age group and also to the patient's general state of health. Moreover, although for descriptive purposes these four factors have been considered separately, it must be pointed out, in conclusion, that they all predispose to infection because of their influence on the functional activity of the bladder. From the point of view of the subject under discussion their main interest lies in the fact that they exemplify a principle, familiar in urinary pathology but not always so easy to demonstrate in detail, that urinary infections are often dependent on defective function of the urinary organs.

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The creation of new slum areas by smoke-polluted atmosphere is to receive special consideration at the annual conference of the National Smoke Abatement Society, which will be held at Glasgow from September 27th to 29th. Dr. J. Johnstone Jervis, medical officer of health for Leeds, will be the chief speaker on the subject of slum clearance and smoke prevention. Dr. J. S. Owens, who is in charge of the investigations into atmospheric pollution on behalf of the Department of Scientific and Industrial Research, and has invented many of the delicate instruments used for the measurement of atmospheric pollution, is to describe the latest developments in this direction. New instruments for the measurement of smoke emission will also be demonstrated. Special consideration is to be given to the effects of smoke upon visibility and aviation, and upon horticulture. The delegates will be given a civic reception by the Lord Provost in the City Chambers, and the discussions will take place in the Council Hall. The chairmen at the various sessions will include Dr. H. A. Des Vœux, president of the society, and Dr. John R. Currie, professor of public health at Glasgow University.

THE VALUE OF RADIOLOGY (DIAGNOSIS AND TREATMENT) AS AN AID TO THE GENERAL PRACTITIONER *

BY

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The three specialties—surgery, radiology, and pathology—have both a technical and a medical side, and have had eminent exponents of one or both aspects. Radiology occupies a position midway between the other two: it is in many ways ancillary, as pathology and bacteriology are (from the practitioner's point of view), while in other ways it is more independent, as the surgical specialties are. Again, the radiologist can rarely diagnose or treat "at a distance," as is the custom of the pathologist and the bacteriologist. The presence of the patient is usually as essential to him as it is to the surgeon. Radiology is therefore more a clinical specialty than a laboratory specialty.

Some of the more outstanding pioneers in the subject have been better known as biologists than as technicians. Some years ago Sir John Bland-Sutton, in speaking of members of his own craft, drew attention to this distinction, and few will deny that radiologists will be more likely to rise high in scientific reputation and in usefulness to their colleagues and the community when they regard themselves primarily as physicians—physicians who practise in radiology—than when they consider themselves only, or essentially, as technicians. In so far as they take their proper place as medical consultants rather than as technical consultants they will face far greater difficulties, and will have many opportunities, too, for exercising tact, both with patients and with their colleagues, but their value and general usefulness will in time be much greater.

Value of a Diagnostic or Therapeutic Method

The value of a diagnostic method is established by its affording evidence which can throw new light on obscure clinical problems, and still more when it can afford signs of such high value as evidence that they can be called pathognomonic. Radiology, it has been said with much truth, has brought forward a far greater number of such pathognomonic signs in its short existence than all the previous centuries of clinical observation could accumulate. In ancient medicine, and well on into the Middle Ages, physicians found, as they thought, infallible diagnostic and prognostic signs in astrological calculations or "images" (Chaucer): the position of the stars at the time of onset of the illness was generally agreed to be pathognomonic. Magic in diagnosis is less popular now, but in treatment, radium—to the public at large, and even to some members of the profession—has undoubtedly magical properties. The more scientific and less magical bases of diagnosis and prognosis began early in clinical observation, and later on progressed as the study of physical signs grew in accuracy. Thus in auscultation as a method we have relative and absolute examples of value in the discovery of a mitral systolic murmur, which can have one of many different interpretations, as compared with that of the presystolic murmur of mitral stenosis (crescendo, and heard supine). While some radiological authorities, such as Köhler, regard the value of radiological diagnostic evidence as always relative and quite secondary to clinical findings, I rather agree with

* Read in opening a discussion in the Section of Radiology and Electrotherapeutics at the Annual Meeting of the British Medical Association, Bournemouth, 1934.

those others, such as Holzknicht, who consider many roentgenological signs as pathognomonic, or more nearly absolute in value.

A long list of useful and pathognomonic signs could be given, but a few instances may suffice: a timely chest examination, which may reveal early tuberculosis masked as influenza, or miliary tuberculosis masked as enteric; bronchiectatic cavities made evident with lipiodol injection; horizontal fluid levels found in lung abscesses, or in gastro-intestinal diverticula, small bowel obstruction, or sinusitis; the demonstration of early aortic aneurysm, or of early heart enlargement; in the gastro-intestinal tract, the unequivocal signs of ulcer or growth, or of such conditions as diverticulitis and polyposis; again, in the examination of the gall-bladder, kidneys, nervous system, and bones and joints there are a great many signs which can well be called pathognomonic.

The value of a therapeutic method is established when it can relieve and possibly cure more "quickly, safely, and pleasantly" than any other method some or many groups of diseased conditions, and still more when it can show a specific curative action on malign processes which are otherwise intractable. In dermatology, gynaecology, and in almost all the other branches of medicine and surgery, the advances in radiotherapy have been immense; and in many fields, such as inflammatory infections, new discoveries are being made almost yearly—as, for instance, the possible value of treatment of pneumonia by short-wave diathermy, and the x -ray treatment of acute and subacute sinusitis and mastoiditis.

By all tests, diagnostic and therapeutic, radiology stands high. In diagnosis it has thrown a flood of light into most of the branches of medicine and surgery, and of its success in therapeutics the same may be said. Thus, apart from the knife or cautery (or to a much less degree foreign proteins and metals), x rays and radium are the only agents known to have an influence on malignant growth. This is the unique achievement of radiotherapy.

Good and Bad Radiology

The first criterion of the value of radiology must be that it is *good* radiology, as estimated by the higher current standards of excellence. Radiology is not nearly so established a science yet as pathology or surgery, with the result that there has been in the past, and still is, far too much imperfect radiology in all its branches—diagnostic and therapeutic x rays and radium therapy.

As an instance of diagnostic error we may recall the fact that hundreds of recruits for the armies of Great Britain and America were wrongly rejected because of the confident radiological diagnosis of "peribronchial phthisis." The boundaries of the normal and pathological in chest radiographs were not nearly so well established twenty years ago as they are to-day, and many radiologists in the war followed pseudo-scientific dogmas which some had laid down, based on false views of chest pathology. From time to time one still hears of extraordinary instances of wrong interpretations of radiographs. There was the recent case of an eminent foreign doctor who spent many months in bed owing to a wrong x -ray diagnosis of "spinal disease" which had been made by a surgeon. Again I may instance a patient who came home from a far-distant colony because of the wrong interpretation of his spasmodic "cascade stomach." He had returned expecting to have a gastric operation, but surgical intervention was shown to be quite unnecessary. Similar and more tragic instances of wrong x -ray and radium treatment are not infrequent, as are instances of failure to apply these agents when indicated.

Radiology: Major and Minor

The problems of correct interpretation in diagnostic radiology are so great, and the subject is still so far from fully explored, that Haenisch of Hamburg, for example, in a recent address in America on "Radiology as a Specialty," held that there is (and can be) no "minor roentgenology" corresponding to "minor surgery" or "minor pathology." I doubt, however, whether this position will meet with general agreement. Surely almost all fractures and dislocations, many foreign body localizations, and much of the fields of elementary thoracic and genito-urinary diagnosis can be held to be "minor roentgenology." If we admit no "minor" roentgenology how shall we prevent technical assistants, radiographers, or general practitioners from practising radiology to a greater or less degree? Granted that interpretation is a medical prerogative, it seems to me that technical and elementary diagnostic radiology cannot be restricted to medical specialists in the subject. In the spheres of electrotherapy and actinotherapy much may be said to be "minor," and can well be delegated to qualified biophysical assistants or technicians. On the other hand, in the sphere of radiotherapeutics (x -ray and radium therapy), little can be said to be "minor radiotherapy," except perhaps some of its dermatological applications.

Lay unqualified practice in radiology should be forbidden by law, just as the prescription and administration of poisons is legally restricted. An American doctor has reported recently a large number of cases of severe gum and jaw damage resulting from x -ray treatment for hypertrichosis administered in beauty parlours.

Radiology as a Specialty: Education

While a new medical science is emerging from the general body of medicine it first proves itself of value to medical and surgical specialists; only later on, when it becomes a consolidated science and art, does it make a wider appeal, reaching the general practitioner and the public. Radiological work is highly appreciated already by our specialist colleagues in medicine and surgery, for the statistics of all radiology departments show that year by year they refer a greater proportion of their hospital patients to us both for diagnosis and for treatment. Radiology has recently been accorded official recognition as a specialty by the institution, by some of the universities and colleges, of diplomas in this science and by insistence on a course of study in the subject by medical students—the general practitioners of the future. For graduate study with a view to specialism a three-years' course is required in some countries, as compared with our one year's special training. In some university hospitals abroad the students receive instruction during their earlier years in the anatomical, physiological, and pathological bases of both diagnostic and therapeutic radiology before the clinical applications are reached. This is an advisable, but at present only, I fear, an idealistic method.

Some raise objection to the overburdening of the undergraduates' curriculum by special teaching in radiology. Students are supposed by some to be able to acquire the knowledge they need in the subject in the wards and out-patient department, but this is impossible; they could gain little in the way of an adequate knowledge of pathology in this manner. Training in any subject must be reasonably full and precise. Take, for example, ophthalmology: here the medical student has to learn all the details of operations, such as those for squint, cataract, and the enucleation of the eye, but he is not likely to put his knowledge into effect by operating on

his patients once he commences private practice. No more is he likely to practise as a radiologist because of an elementary knowledge of the subject. If the curriculum is overburdened, much of what is unnecessary in it should be drastically excised so that sufficient attention can be paid to recent subjects of such great and general importance as radiology.

It is difficult for us to realize how the whole face of medicine and surgery has been changed within the lifetime of most of us by the advent of radiology. Thus the fourth edition (1902) of Osler's *Medicine* had only about 100 words on x rays in a monumental volume of nearly 700,000 words of text; and his 1912 edition was much behindhand in its references, failing to note the use of x rays in diagnosis of lung tuberculosis or gastric cancer, though it is mentioned as of help in "hour-glass stomach." But in 1907 there were already observations on pulmonary tuberculosis as shown by x rays; in 1908 on cancer of the stomach and colon; and in 1911 duodenal ulcer first came into prominence through surgical and radiological advances.

Advance in any new specialty is slow enough owing to internal and external obstacles, but recognition by others of the advances made is even slower. We should realize that the diagnostic and curative possibilities of radiology will largely remain as, so to speak, capital locked up and not put to full use, unless its achievements can be so exhibited as to make a wide appeal to the general practitioners of each country. Many practitioners use it only as the medical defence societies urge—for fractures and dislocations. Others are over-credulous, as the practitioner in America who lately referred a patient to a radiologist for measurement of the mitral valve! Radiology offers an immense range of opportunities for proving its value, and has also very definite limitations: to diffuse more widely accurate knowledge of it the very active Radiological Society of North America has recently organized a three-year campaign of education in radiology throughout the country, and it might be well perhaps if its example were to be followed here. The private practitioners in a country have a unique position; they see the vast majority of patients first of all, and they are thus in a position to advise their patients (for example, in cases of gastric ulcer) whether they will undergo medical, surgical, or other specialist treatments. In addition, practitioners have a very good knowledge of the ultimate results of medical or specialist treatments. Their co-operation, therefore, must be solicited if the general level of health of the community is to benefit by recent advances in medicine.

As to delay in diagnosis, do we not often see patients who have suffered for years from undiagnosed gastric symptoms before a barium meal examination has been suggested? And in the sphere of treatment, how many patients suffering from exophthalmic goitre, leukaemia, and menorrhagia have spent months or years of ill-health with little-availing medical treatment before radiotherapy has been adopted?

Early Diagnosis and Treatment of Cancer

The most important sphere in which the co-operation of the general practitioner is essential is the early diagnosis and treatment of malignant disease. This has been insisted on by all the cancer organizations throughout the world, but it is only by the general practitioners gradually coming to realize the possibilities of radiotherapy that early treatment can be instituted for very many cancer patients. There are two reasons for this: (1) that so many patients are already at an inoperable stage by the time the disease is disclosed or discovered; and (2) that so many patients are not good operative

risks or have an invincible repugnance to operation. Because of this, the possibilities of radiotherapy should be widely known, and for each case should be explored without delay. Many of these patients would benefit by being referred directly to the radiotherapist. Professor Regaud has well said that the *first* treatment that the cancer patient has is the all-important treatment, and that it is quite indefensible to take up the attitude of only calling on the aid of the radiotherapist when surgery has proved a failure. On the contrary, the radiotherapy expert should be asked for his opinion before the commencement of each patient's treatment, in case radiotherapy is indicated then or at a later date.

If we consider the statistics of the Ministry of Health as to the number of deaths occurring annually from cancer of different regions—for example, 5,000 or more from cancer of the breast—we may ask: For how many of such cases has adequate radiotherapy been utilized? And where such a valuable aid has not been called in: What circumstances prevented its utilization? It is in the public interest that such questions be asked. I ventured to point this out in an article in the *Lancet* on breast cancer six years ago, but the question still awaits a satisfactory solution.

This discussion would, I believe, prove of permanent value if, under the auspices of the Section in the British Medical Association, or otherwise, steps could be taken towards an active campaign in radiology similar to that which has been carried out in Sweden at intervals in the past twenty years, and has been in progress lately in North America in the medical and lay press. Such campaigns have resulted in Sweden, and ought to result in Anglo-Saxon lands also, in a material raising of the general standard of the public health, and in an increased respect of the public for modern medicine, and for radiology, one of its most recent—and valuable—subdivisions.

RADIOLOGY AS AN AID TO THE GENERAL PRACTITIONER*

BY

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In this discussion I speak as a general practitioner who regards all kinds of specialist treatment as primarily arising from the needs of the general practitioner, and closely associated with, and dependent upon, his interest and co-operation.

In most forms of specialist practice the association between specialist and general practitioner is close, and necessitates consultation between the parties, to the advantage of all concerned. An exception to this relationship exists notably in the case of the bacteriologist and pathologist. Here the assistance required can generally be obtained without a personal interview. Nevertheless, even in this case, I am of opinion that there is a definite loss in the acquisition of knowledge by both parties resulting from the lack of personal discussion and the substitution of written reports.

The relationship between the radiologist and general practitioner may be said to fall somewhere between the ideal of the surgical or medical consultation and the more remote pathological or bacteriological report. My first point is to advocate a more close and personal contact between the radiologist and the general practitioner, for I think that in the peculiar nature of your specialty there is a danger of the tie becoming weakened further

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