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

E. KAYE LE FLEMING, M.A., M.D., B.Ch.

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

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

or even lost, to the disadvantage of all concerned. The reasons for this may be put under three heads.

1. The science of radiology (especially in its therapeutic aspect) is technically outside the sphere of knowledge of the general practitioner.

2. The science of its application is advancing so rapidly that the general practitioner in busy practice cannot hope to keep pace with it. In the case of those of my own standing in the profession it may be said to have developed altogether since we entered practice.

3. It is necessarily an *expensive* specialty. The general practitioner has to study closely the means of his patient, and must therefore often hesitate to recommend an expensive form of treatment without good knowledge of its nature and its probable efficacy.

With these general observations I turn to the main conditions which experience leads me to seek your assistance, and I have no doubt that if my knowledge of your specialty was more complete there would be fewer gaps in the rather disjointed category which I have made out.

The Field of Diagnosis

(a) *Bone Injuries and Misplacements.*—The value of x rays needs no emphasis in this class of case. While it is easy to point to the necessity of this kind of examination in all cases (the Medical Defence Union is eloquent on this point) in practice this is not possible. The general practitioner must discriminate to save needless expense. For example, as medical officer to a public school, if I acted literally on this advice I should be sending a daily stream over here to be examined by x rays. I could give more work to the radiologist if there were a simpler and less expensive method of examining minor injuries to show direct fracture or misplacement. I am quite aware of the difficulties involved, and am in no doubt as to the answer I shall receive.

(b) *The Thorax.*—I will not do more than acknowledge the great help of x rays in locating fluid in the pleural cavity. As regards pulmonary tuberculosis, the public has a blind faith in the result of an x -ray picture of the chest in the diagnosis of this condition. The interpretation of those films (in which I am specially interested) is, I think, one of the most difficult and highly specialized branches of x -ray reading. Their practical value is great in persuading a patient with early symptoms to appreciate the need for strict treatment. I think the practitioner without more than a general knowledge is apt to be unduly impressed by signs of disease. He would sometimes take a more reasoned view if he had a film of his own chest as a standard. The value of this form of examination in ascertaining whether disease is sufficiently unilateral, in deciding the suitability of limiting expansion by artificial pneumothorax or phrenic avulsion, is now well recognized.

As regards the heart, during war service at Netley I was fortunate in having opportunity during spare time of screening chests in the x -ray room. At first, chiefly interested in lungs, I soon became more and more interested in screening the heart shadow, and became accustomed to screen all patients with heart symptoms in my wards. The value of the information derived from this addition to the usual methods of examination impressed itself more and more forcibly on me. There is a saying that "Every picture tells a story," and I think this is true of the x -ray picture of the heart. The variation in shape and size, the vertical and transverse limits, the general appearances of the shadow can, I think, add appreciably to the knowledge necessary in treating heart conditions. On attempting to put this method into practical use on returning to civil practice I was confronted with a difficulty that I had not foreseen. It is only when the method used is the same that results are

comparable. I would press to-day the need for a fixed method of procedure in making these examinations. The upright position, the distance at which exposure is made, the clear definition of the mid-sternal line and the nipple point, when possible, are the most important points.

(c) *Abdomen.*—The bismuth meal raises a special problem. There is need for something more simple and less expensive than an elaborate and costly series of beautiful pictures where expense is so often an important consideration. In many cases a series of drawings from screening, with regional photographs, would be sufficient. The results of x -ray pictures of doubtful appendix cases is disappointing in my experience. How far can we rely on an x -ray of the gall-bladder or kidney in the case of suspected stone? Has the introduction of the use of dyes reached a degree of certainty in such cases?

Treatment

There are in my experience various conditions in which the general practitioner feels the need of this kind of treatment, but is often deterred by lack of knowledge of the likelihood of its success.

Exophthalmic Goitre.—I believe treatment by x rays of this group of diseases is carried out frequently. Personally, having seen one case where the result appeared to be most unsatisfactory, I have hesitated to advise it again. If there are cases which are suitable for this method of treatment, what are the conditions by which they can be distinguished?

Sterilization in the Female.—The general practitioner is keenly interested in the production of sterility in the female by x rays or radium. The most common type of case is where production of an artificial menopause or the quickening of the natural process is necessary for the welfare of the patient. I hope we shall hear to-day something definite on this point. The practitioner wants to be in a position to say to his patient that this form of treatment will entail (roughly speaking) so many visits to the radiologist and the approximate cost. I would emphasize at this point how much the practitioner needs to know the cost and time factors in all kinds of specialist treatments. A further important point in cases of this kind is how far we can assure or reassure our patients on the after-effects of such treatment.

Sterilization to Prevent Conception.—I am not one of those (and there are many in the profession) who view with alarm the state of the law in this country in this connexion. I have had cases, and I can envisage others, where I should not hesitate to advise and abet in obtaining security against conception by x rays or radium. It would be of interest to hear if radiologists view with disquiet the giving of treatment with this object on the request of a practitioner of experience and repute. One frequently hears in the ranks of both the profession and the public the opinion that the laws of this country need amending in relation to sterilization and the induction of abortion. I can only say in my professional experience I have never felt the need, nor have I felt handicapped in giving advice or treatment to this end.

Skin Treatment.—I imagine that practitioners as a class are fully alive to the success of radium and x -ray treatment of malignant disease of the skin and epithelium. Rodent ulcer, cancer of the lip and tongue, and of the cervix, are cases in point. But there are many conditions of the skin where the practitioner feels that x -ray treatment might be of value, but he is ignorant of its possibilities. Many dermatologists must be using this form of treatment in the more chronic skin eruptions. Why do we not hear more of the results and the conclusions at which they arrive? How far can we rely on such treatment, for example, for a speedy cure of multiple warts on the hands? Patches of psoriasis and the like

are also a frequent difficulty in general practice ; we should often advise α -ray treatment if we knew more of its probable utility.

Carcinoma of the Breast.—This is a condition which has been only too familiar to the general practitioner from the days when the early use of the knife offered the only prospect of cure to the more efficient stage of post-operative α -ray treatment. The good results of this addition to our resources are widely appreciated, but, from the patient's point of view, the number of treatments needed, the cost, and loss of time involved, as well as the strain of a procedure that must ever remind the afflicted of the possibility of recurrence, are conditions which perhaps we are apt to appraise too lightly. Personally, the results that I have at present seen from the treatment of this condition by radium encourages me to hope that the knife will in time be displaced by radium and the need for subsequent α -ray exposure greatly lessened.

A CONTRIBUTION TO THE COMPARATIVE STUDY OF THE TUBERCULIN TESTS IN INFANTS AND CHILDREN

BY

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A positive tuberculin test is now universally regarded as indicating tuberculous infection. The importance of the test in infancy and childhood is therefore threefold: (a) *in the diagnosis of tuberculous disease*, for the younger the child the more likely is a positive tuberculin test to be associated with an active tuberculous lesion; (b) *in dealing with home contacts*, for the test will indicate those already infected, a point of great importance when considering separation of a child from a tuberculous parent; and (c) *in connexion with B.C.G. vaccination*, as it is claimed that both the injection and the ingestion of this vaccine is followed after a varying interval, in a large proportion of cases, by a state of tuberculin hypersensitivity, even if all contact with tuberculous individuals is avoided—so that a positive tuberculin test will indicate that the period of isolation advisable after vaccination can be terminated, and it will also form a contraindication to revaccination.

It therefore seems essential that the various known tuberculin tests be compared not only as regards their relative sensitivity, but as regards the ease with which they can be employed in infants and children in practice; and, moreover, that there should be universal agreement as to what constitutes the minimum positive reaction for each test. Not only is the latter factor found to vary according to author, but one finds important and careful investigations reported in which no statement at all is made as to what the writers have considered a positive reaction.

Material of Investigation

The 166 infants and children tested were under the care of one of us (B. W.-H.) either at the Hôpital des Enfants-Malades, Paris, or the Fondation Zola, Médan, or in the wards of Professor Ombredanne, surgeon to the Hôpital des Enfants-Malades. Their ages were as follows: under 1 year, seventy-two; 1 year, thirty-two; 2 to 4 years, sixteen; and 5 to 16 years, forty-six. As the chief importance of the tuberculin test is in children under the age of 2 years, it was considered preferable for the purpose of this investigation to divide the

Conclusion

Though I am only too conscious of the disconnected sequence of my remarks, and of the many gaps in the subject, I hope that I have raised a sufficient number of points from the angle of view of the general practitioner to stimulate discussion in a useful direction. May I summarize my chief points as follows?

1. The lack of close co-operation between general practitioner and radiologist.
2. The difficulty the general practitioner experiences in keeping abreast with the advances in the development of your specialty.
3. The need for a closer co-operation within your ranks in order to harvest the experiences and the results at which you arrive.
4. The need for a more systematic presentation of these results to the general practitioner who seeks them, more particularly in post-graduate study.

children into two groups: Group I (under 2 years), 104; and Group II (over 2 years), sixty-two. Ten children were diagnosed as suffering from, or suspected of, clinical tuberculosis. The classification of the two groups was as follows:

Group I: Cervical adenitis.
Arthritis of knee.

Group II: Pulmonary tuberculosis (T.B. found).
Pulmonary tuberculosis (no T.B. found).
Tuberculous meningitis (no T.B. found).
Tracheobronchial adenitis (no T.B. found).
Cold abscess of rib.
Pleurisy (T.B. found).
Pleurisy (no T.B. found).
Anal fistula.

The remaining 156 children may be considered as clinically non-tuberculous. In most of the children of Group II information as to whether they had been vaccinated with B.C.G. was not available. This was, however, known in ninety-six of the 104 children under 2 years, amongst whom twenty-nine had been vaccinated—seven less than six weeks, six between six weeks and three months, and sixteen over three months before the tests were performed.

Technique of Investigation

The tests were carried out over a period of two months on five consecutive series of children. All the tests (with the exception of the Pirquet tests in the first series of thirty-eight children, which were performed by B. W.-H.) were carried out, and all the reactions read and noted, by one of us (G. G. K.). The first series of thirty-eight children did not have a Moro test, otherwise the routine was the same.

The Pirquet, the Mantoux (1 in 1,000), and the Moro tests were performed at the same time. Two days later the test areas were inspected, and if all were found negative (or doubtful) the Mantoux test (1 in 100) was carried out. Two days later the test areas were again examined, and, if still negative, the Mantoux test (1 in 10) was performed, a control with broth being done at the same time. The tests were again read two and four days later, whatever the result.

The site of all the tests (even if positive) was thus inspected on alternate days for eight days (unless the patient had left the hospital), and (except in the case of the Moro test, where the type of response does not lend itself to these measurements) the reactions, *however slight*, were measured and palpated. Erythema was noted as "faint or marked," swelling as "slight, medium, or marked." Discoloration (blue, green, yellow) indicating bruising was also noted, as well as staining following erythema.

Technique of Individual Tests

Pirquet Test.—A drop of pure tuberculin (Pasteur Institute) was placed on the skin of the upper part of the right arm with the blunt end of a vaccinostyle.* A scarification about

* This is a metal instrument closely resembling a pen nib, commonly used for performing this test in France.