Clinical Picture

Most of the patients were children and were admitted initially to hospital. Parents gave a history of febrile illness two weeks previously, invariably with a sore throat or other obvious upper respiratory infection. Frequently oral penicillin had been given by the general practitioner. There then followed a period of apparent recovery until perhaps the day before admission, when the child again became unwell, with loss of appetite, lassitude, pallor and puffiness of the face, and, on occasion, headache. In some cases the parents had observed the passing of dark urine. On examination the urine was found to be loaded with albumin and gave a positive chemical test for blood, which was confirmed by microscopy.

Two weeks after the initial infection positive nose or throat swabs were obtained in a high percentage of children; in all others the anti-streptolysin titre was raised. The organism found was invariably the haemolytic streptococcus (Lancefield group A type 12). Approximately 60% had raised blood pressures, and in two cases this was high enough to produce hypertensive encephalopathy. One of these patients presented in the casualty department as a case of sudden blindness.

On admission to hospital the lingering presence of the streptococcus was always assumed and every patient received a 14-day course of intramuscular penicillin. Cases of hypertension were sedated and every patient was confined strictly to bed until the Addis count (a measure of microscopic haematuria) approached normal. When the number of red blood cells in an overnight 12-hour specimen of urine was down to 1,000,000, gradual mobilization of the patient began. He was allowed home when the red cells were less than 500,000. The average length of bed rest required was 15 weeks, though some cases took as long as 20 weeks to produce a normal Addis count. Hypertension rapidly disappeared, usually within 10 days. Several cases had grossly enlarged, pitted, and unhealthy tonsils, and one child had an infected aural polyp. These cases showed slow response to medical treatment, but when surgery was carried out the subsequent improvement was impressive.

After discharge from hospital all cases were followed up. Earlier cases showed an increase in the Addis count associated with comparatively mild upper respiratory infections. Many showed increased counts even without obvious infection. Later patients were sent home on small prophylactic doses of phenoxymethylpenicillin daily, and these have so far shown a remarkable improvement in the follow-up condition. It is too early yet to assess the long-term effects of the disease and the treatment, but from preliminary observations it would seem that there is unlikely to be any gross permanent renal damage.

Discussion

In the present outbreak the exchange of information between the health department and medical practitioners was probably of value. The experience obtained suggests that in future outbreaks of serious infections which are not notifiable it would be a useful measure to alert all practitioners as soon as possible, since early treatment may help in modifying the severity of the attack or preventing complications.

In view of the complications likely to arise from streptococcal reinfection, it is worth while considering whether schoolchildren should not receive special supervision after an attack of nephritis. Teachers could be advised that they should report at once to the principal school medical officer in the event of upper respiratory or cutaneous infections in the class or school. Any child at special risk of nephritis reinfection could then be temporarily excluded. It would seem advisable also that parents should be cautioned of the liability of reinfection, so that crowded gatherings were avoided until the child's resistance was considered satisfactory.

Summary

A description is given of an outbreak of nephritis in Northamptonshire due to group A type 12 haemolytic streptococci. In all, 89 cases were ascertained; 73 occurred in children under 16 years of age, 52% of whom were boys.

Many of the cases were notified by practitioners in response to a circular letter which notified them of the outbreak and asked for particulars regarding cases in their practice. Early exchange of such information would appear to be a useful measure in serious infections that are not notifiable.

No association was noted between the distribution of nephritis and scarlet-fever cases during the period under review.

The cases showed the familiar pattern of acute nephritis, though the severity varied greatly from patient to patient. Albuminuria and transient "frank haematuria" were constant features. Following initial penicillin (intramuscular), prolonged bed rest was the most important part of the treatment, its duration being dictated by weekly microscopy of the urine and E.S.R. estimation.

The importance of keeping post-nephritis free of further streptococcal infection is emphasized. In this respect the oral administration of phenoxymethylpenicillin is a safe and efficient method of prophylaxis. In addition it may be considered desirable to advise parents regarding the risk of reinfection, and for the children to receive special supervision at school.

We thank Dr. C. M. Smith, County Medical Officer of Health for Northamptonshire, for his advice; Dr. I. H. Gosset, consultant paediatrician, for permission to refer to cases under his care; and all medical practitioners in the county, without whose co-operation the outbreak could not have been investigated.

POSSIBLE DISADVANTAGES OF A CHEST RADIOGRAPHY SERVICE FOR GENERAL PRACTITIONERS

BY

PETER STRADLING, M.D., M.R.C.P.
Chest Physician and Lecturer

AND

W. M. DIXON, M.B., M.R.C.P.
Formerly Assistant Chest Physician

*From the Hammersmith Chest Clinic and Postgraduate
Medical School of London*

It is common practice in many chest clinics to provide, in addition to normal consultations, special sessions to which practitioners may refer their patients for chest radiography only. These patients form a selected group in that they are usually referred because of symptoms which could arise from respiratory disease. If a chest radiograph shows an abnormality it is mutually understood by practitioner and physician that the patient may be recalled to the clinic for further investigation.

The diagnostic value of this service is demonstrated by the regularly high yield of abnormalities; its possible disadvantages are seldom even discussed. Disease not obvious on the chest film might be found by clinical examination. Moreover, a normal x-ray report from the clinic might allay practitioners' fears and, by false reassurance, delay diagnosis.

The following experiment was designed to determine, *in those patients whose chest radiographs were reported as normal*, (a) the amount of clinically discoverable disease present on attendance, (b) the incidence of early disease missed on radiography as represented by its appearance within the next few months, and (c) the extent to which normal x-ray reports influenced practitioners in their appreciation of any subsequent development.

Method

The routine "x-ray only" service in this clinic has always been conducted on 70-mm. roll film. Both postero-anterior and antero-posterior lordotic films are taken, and subsequently read by two observers independently to minimize error due to observer variation (Stradling and Johnston, 1955). In addition, during the period October, 1956, to May, 1957, inclusive, with the full co-operation of the practitioners concerned, certain of the referred patients underwent clinical examination at the time of routine radiography. To avoid bias and to obtain a group of suitable size for analysis, a systematic sampling method was employed; all patients born in the month of May were invited to co-operate, and none refused to be examined.

At the clinical interview the physician took a careful history, conducted a full physical examination, including urinalysis, and viewed a full-sized chest radiograph. When necessary, patients were referred to other hospital departments for investigation. When the 70-mm. films were read on the following day the patients' names on these films were obscured to avoid possible recognition before the observers had given their reports. If an abnormality was found during this routine film reading the patient was excluded from further study in the systematic sample even if already examined clinically. Thus further consideration is of a representative group of patients whose miniature radiographs were all considered normal.

During the same months a second systematic sample of patients (all those born in November) was collected for later analysis. These patients were not examined in the clinic, but those who were reported to have normal miniature radiographs were followed up four to eight months later by means of a questionnaire addressed to their practitioners. Inquiries were made to determine subsequent clinical developments within the follow-up period, any further action practitioners may have taken following the report of a normal chest radiograph, and in particular whether this report had led to diagnostic delay through the false reassurance of doctor or patient. It was specifically asked whether the report had been (a) of assistance, (b) of no help, or (c) actually misleading in this respect.

Results

Of 673 patients radiographed during the period under review, 155 (23%) were recalled for further investigation by the routine procedure when the miniature films were read. This again confirms the positive value of such a service and also establishes that the yield of abnormalities was in no way unusual during this period, for in 1955 and 1956 respectively 25% and 18% of the films proved to be abnormal. That the service itself provides representative material for analysis is shown by the figure of 4,000-5,000 miniature radiographs taken annually and the large number of practitioners referring patients.

The 74 patients forming the first systematic sample also proved representative in this respect, for 18 (24%) would have been recalled on viewing the 70-mm. films also. As members of the sample, however, they had already been examined and appropriate action taken. On no occasion was an abnormality discovered by the routine reading of miniature films in a patient already considered normal at the full examination undertaken as part of the experiment. Furthermore, no abnormality was discovered on the large radiographs that was not seen on the miniatures.

There remain in the first sample 56 patients whose miniature films were reported as normal. On physical examination 4 (5.4% of the sample) additional thoracic abnormalities were found in these patients. Two of these conditions (2.7%) proved significant and required treatment: one elderly man suffered from chronic bronchitis aggravated by excessive smoking, which he was advised to stop; another had an acute exacerbation of his chronic bronchitis, which was successfully treated with tetracycline. Relatively insignificant abnormalities not requiring treatment were found in the other two patients: one had mild costochondritis and the other a slight degree of pectus excavatum.

Significant extrathoracic disease was discovered in five patients (6.7%). One young woman had chronic paranasal sinusitis not previously diagnosed, two had iron-deficiency anaemia, and one had severe hypertension requiring hypotensive therapy. The fifth patient had cardiac neurosis: reassurance following full physical examination and investigation with normal findings led to relief of her symptoms. In two other patients (2.7%) insignificant abnormalities were discovered: mild systemic hypertension at the age of 77 and splenomegaly due to chronic malaria, already known to the practitioner.

By chance the second systematic sample also consisted of 74 patients. The number of abnormal reports on the miniature radiographs was 11 (13.5%), and these are not considered further. Questionnaires were circulated in respect of the remaining 63 patients, whose miniature films were reported normal, and every one of the 32 practitioners involved responded to the inquiry. Only two patients are untraced: they failed to revisit their doctors and had apparently left the district.

There remain for analysis 61 replies relating to patients with normal radiographs. All these patients were seen by their doctors soon after the initial radiography, and of the 61 replies, 60 stated that the report had been of assistance in making a diagnosis; usually by narrowing the field of possibilities or practically excluding a more serious pulmonary disease such as carcinoma or tuberculosis. Of these 60 patients, their practitioners had considered 48 normal or to have recovered from the illness which prompted reference for chest radiography. In the other 12 (16.2% of the sample) definite diagnoses were made by the practitioners: bronchitis with or without asthma was present in eight patients (10.8% of the sample) and non-thoracic disease in four others (5.4%). The diagnoses were hepatitis, hypochromic anaemia, alcoholic dyspepsia, and gout.

The subsequent clinical status of all 61 patients was either known or checked on receipt of the replies. None had developed any further disease during the follow-up period. In one, however, carcinoma of the bronchus was diagnosed soon after follow-up was complete. This case is discussed below.

On only one occasion did a practitioner feel that the radiograph had not helped towards a diagnosis. This patient, with pain in the chest and chronic bronchitis, was considered to have two fractured ribs on subsequent clinical examination at another hospital. The fractures, notoriously difficult to diagnose radiologically, were not visible on scrutiny of our films.

Discussion and Conclusions

Chest radiography services, similar to that described, are now provided for practitioners by a large proportion of chest clinics. The widespread acceptance of such a facility is largely based upon the undoubted convenience to both patient and practitioner and an appreciation by the majority of the profession of its intrinsic value as a diagnostic aid. Moreover, the public health value of these services is very real in the case of tuberculosis: it is usual to obtain a yield of cases approximately 10 times that from mass radiography surveys of presumably healthy populations

(Toussaint and Pritchard, 1944; Sutherland, 1952; Trenchard and Grenville-Mathers, 1952). Early diagnosis, so often achieved when radiology is applied promptly to patients with minor symptoms, helps to prevent further spread of his disease both in the patient and in the community. It is the general practitioner who is most often presented with the diagnostic opportunity. He must act, but can do so only if he has ready access to diagnostic radiology (Stradling, 1948).

Nevertheless, there has always been an uneasy feeling in the minds of some physicians that perhaps such services were misconceived. It is thought by them that the ready availability of chest radiography might encourage slipshod physical examinations; that the x-ray examination might be used as an unwise short-cut to diagnosis or as a method of passing to a colleague responsibility for further action. From this it is argued that diagnostic errors can be avoided only by full physical examination at hospital or clinic whenever patients attend for chest radiography. But this would defeat one of the main aims of routine radiography services—the ability to deal rapidly with as many patients as practitioners choose to refer. Certainly it is only by the use of radiography that patients with minimal or no symptoms will have their pulmonary disease discovered in an early and treatable stage. The fact that the examination is over quickly is one of the main attractions to the patient; many of these relatively fit people would not attend if they thought that a long interview and an examination were involved.

The advantages of such radiography services have long been accepted by most chest physicians as outweighing possible disadvantages. Indirect evidence that this is justified, based on a retrospective survey of radiographs taken at routine consultations in a chest clinic, has been provided by Bradbury *et al.* (1951). In a group of 200 consecutive new patients every one of the 21 shown to have abnormalities on full clinical examination was picked out for recall on resurvey of the radiographs alone.

Our direct assessment of the situation has confirmed our confidence in the radiography service provided. Only 2.7% of the first sample of patients investigated proved to have thoracic disease needing treatment at the time their miniature films were reported normal. The corresponding figure for non-thoracic disease was 6.7%. These abnormalities were all either known to the practitioners concerned or discoverable by clinical examination in the surgery.

Furthermore, it is significant that the figures for non-thoracic disease discovered by physical examination, either under conditions of controlled trial at hospital or in the practitioners' surgeries, proved similar (6.7% and 5.4%). This very similarity indicates to us that practitioners are not apparently being distracted from diagnosing extra-thoracic disease by the report of a "normal" chest radiograph. Far from suggesting that such a report delayed diagnosis, our findings have revealed it as a positive, welcome, and correctly used diagnostic aid. Of the 32 doctors circulated with the questionnaire, 16 added unsolicited footnotes indicating the great importance they attached to a freely available chest radiography service. None of the 61 patients with normal reports on their initial radiographs developed any significant illness during the follow-up period of four to eight months. It is felt that this period is long enough to have revealed any such illness that might have been present at a detectable stage when radiography took place. The bronchial carcinoma diagnosed in one patient soon after follow-up was completed is considered to be an unrelated finding. This patient was admitted urgently with superior vena caval obstruction ten months after the symptoms leading to radiography had subsided. It is unlikely that an earlier diagnosis would have been made had the original radiographs never been taken; the terminal symptoms had been present for only a few weeks.

The success of a freely available chest radiography service depends upon the mutual co-operation of general practitioner and chest physician. Each has his full part to play: the practitioner in referring any patient with even minor

pulmonary symptoms; the physician in detecting the abnormal films and taking appropriate action on these. The practitioner also retains responsibility for those patients reported to have normal films: symptoms must be accounted for and further investigations arranged if this proves difficult. Radiography must be recognized for what it is—a diagnostic aid that must take its place with all others necessary for building up the full clinical picture. Repeat radiography at a suitable interval is essential if suspicious symptoms persist.

In our experience the necessary co-operation is fully obtainable. The high yield of initial abnormalities, the low yield of disease on additional physical examination, and the absence of serious developments during a period of follow-up, all indicate that such services are being used to the best advantage and that they are of the highest clinical and public health value. Disadvantages are more hypothetical than real, and are far outweighed by the advantages to practitioner, physician, and community alike.

Summary

Many chest clinics provide a chest radiography service for general practitioners in addition to the usual consulting sessions. The positive value of such a service is acknowledged, but its possible disadvantages have not previously been investigated.

Clinical examinations were made of 74 patients, chosen by a systematic sampling method from a group referred for "x-ray only." The thoracic abnormalities so discovered in those with normal chest radiographs represented 5.4% of the sample. Another 6.7% had non-thoracic diseases detected by clinical but not by radiological examination.

A second systematic sample was followed up some months later by a questionnaire addressed to the patients' practitioners. This showed that a similar incidence of thoracic and non-thoracic disease had been found by them. It is concluded that practitioners are not distracted from diagnosis by a report of a normal radiograph: such a report often proved of great value in excluding serious disease. The possible disadvantages of a chest radiography service for general practitioners are largely theoretical and are not borne out by practical experience.

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The Ministry of Pensions and National Insurance has again published a *Digest of Statistics Analysing Certificates of Incapacity*. The new volume refers to the year 1955–6, but includes some comparison with previous years. The statistics do not cover illnesses which are too short for a claim to be made or sickness among people not eligible to claim. The *Digest* is available to interested persons on application to the Statistics Division of the Ministry at 10, John Adam Street, London, W.C.2.