

## Some Observations on the X-ray Treatment of Ankylosing Spondylitis

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WE began to use the X-ray treatment of ankylosing spondylitis at University College Hospital three years ago, and have treated 62 patients, 60 males and 2 females. In order to evaluate the results, I first classified the cases radiologically according to the location and extent of the changes observed:

- (1) Sacro-iliac changes only, 15 cases;
- (2) Spinal changes in addition, without ankylosis, 23 cases;
- (3) Spinal changes in addition, with partial ankylosis, 15 cases;
- (4) Spinal changes in addition, with complete ankylosis, 1 case.

But this was not satisfactory because the X-ray appearances do not necessarily bear any relation to the severity of the disease; for example, the clinical disease has often existed for some time before any visible bony or other changes can be detected, while, on the other hand, symptoms may have been of short duration and the radiological signs may be comparatively advanced.

A further point is that the X-ray appearances do not assist one to assess the results of the treatment since they appear to be irreversible.

I have, therefore, also classified the cases according to the length of history. I have divided the series into three stages:

- (1) Cases of less than one year's duration (11 cases);
- (2) More than one year and less than three years (17 cases);
- (3) Those with symptoms for more than 3 years (34 cases).

So rather more than half of the patients had had symptoms for more than three years.

The course of treatment to the sacro-iliac joints and vertebral column consists of eighteen treatments.

*Technique of treatment.*—There are two methods of irradiation generally in use, the wide field or "bath" technique and the small field local application.

I use the latter because there appears to me to be various grave disadvantages to the wide field method in the treatment of spondylitis. In the wide field method large masses of tissue are irradiated and although the dose given on the skin is very small, I do not think it has been realized enough that the integral dose, i.e. the dose received by the whole volume of tissue, is large and causes considerable constitutional disturbances; at the present moment, much research work is being carried out on the integral dose and its effect on the whole body, and we have a lot to learn in this direction. It has been said that no damage can be done to the patient, but several patients I have known, who have been treated by the wide field method, have been made so ill that they have given up the treatment, and two women treated by this method elsewhere have had amenorrhœa ever since irradiation given several years ago. Some think that the constitutional effect is the object of the wide field method, but if the same good results can be obtained without such constitutional disturbances by more limited irradiation, I feel it is wiser not to irradiate the whole body.

The ill-effects from the small field local application to the spine are very slight. Some patients complain of transient nausea when the lumbar spine is being irradiated. Freyburg and others (1941) mention leukopenia following this technique. I have not had any such cases in my series.

To what extent can the benefit following irradiation be explained by the psychological effect of a new treatment? Many of the patients here discussed have had various forms of treatment with little or no improvement until X-ray treatment was added.

Some experiments by Freyburg and others seem to show that when lead screens are introduced to cut off irradiation without the patient's knowledge, no benefit resulted. When the screens were removed later, significant improvement followed. Moreover, I have frequently observed improvement in the section of the spine treated, without change in other parts of the body.

In order to gauge the effect of treatment, we kept records of the following observations: (1) Relief of pain; (2) alteration in range of movement; (3) alteration in general condition, such as quality of sleep and weight; (4) blood-count; (5) sedimentation rate; (6) radiological appearances.

In cases which responded, there was definite relief from pain. Partial relief might come during the course of treatment, but usually a week or two after the end of the course. Often complete relief did not come until after a second course given six or eight months

later. As the pain diminished, movements of the spine became freer. The degree of movement attained was dependent on the extent of ankylosis present. All movements were encouraged by massage and by muscular and breathing exercises. We found that the muscles in patients who had been cripples for several years or who had been immobilized for some time, were so weak that although they were not in pain, they were at first quite unable to use their limbs. I have installed a rowing machine in the ward, which I find is of considerable value in gaining the interest and co-operation of the patients. I would like to stress that physiotherapy given in combination with X-ray treatment is regarded as essential in obtaining good results.

As the pain diminished, their sleep improved and their general condition altered for the better, their weight increasing. It should be added that all patients were given iron for the anæmia which was almost invariably present.

*Sedimentation rate.*—We have followed the changes in the sedimentation rate after irradiation in the hope that it would help us to estimate the effect of the treatment. This hope has not been fulfilled. The sedimentation rate is taken at the beginning of the course and then at varying intervals afterwards. It has been said that if the patient responds to the X-ray treatment, the sedimentation rate falls. We have found in our series that if the sedimentation rate at the beginning of the course was high, in the region, say, of 30 to 70 mm. in the first hour, then it rose even higher and only began to fall many months later. For instance, in one case, the sedimentation rate at the beginning of treatment was 43 mm. in the first hour. Four months later it was 60 mm. in the first hour and later it dropped to 30 mm. in the first hour. The patient had, however, made steady improvement all along. If, on the other hand, the sedimentation rate was only slightly raised, it fell one to two months after the end of treatment, without a preliminary rise.

From this it would appear that the changes in the sedimentation rate after treatment are not always parallel to the clinical improvement. This is an interesting feature which will need further study. At any rate, it is, I think, already recognized that the severity of the clinical condition is not correlated with the change in sedimentation rate.

*Changes in radiograph.*—In no case in which changes in the sacro-iliac joints or vertebral column were present at the beginning of the course was there any improvement in the X-ray picture after irradiation. The X-ray did not change for better or worse over the period of observation. It is, of course, impossible for me to say at what rate changes were proceeding before treatment was begun.

Before discussing the results, here are some details of a typical case.

The history of the patient, aged 22, appeared to date from a fall on the back in January 1938. He had, however, no pain or symptoms in his back until December 1938, ten months after the fall, when his back again began to get stiff and he suffered severe pain. In March 1940, his left leg and hip also began to stiffen. He was treated with massage and ultraviolet light, which improved the leg and hip somewhat, but made no alteration to the back.

In December 1940 he was X-rayed for the first time, when spondylitic changes were seen in the sacro-iliac joints and particularly in the lumbar region.

On examination in February 1941, he was a cripple. He could only hobble with two sticks with a bent back, the back and hips being held in a state of partial flexion. He looked pale and ill, and severe pain prevented him from sleeping. Movement of the spine and hips was extremely limited.

X-ray treatment was given to the spine and hips, and massage and breathing exercises were also given. At the end of the course the general condition had improved. The patient was sleeping well and was free from pain. The range of movement of spine and hips had increased and the left leg could be straightened. He continued to make steady improvement. Six months later he was given a second course of treatment to his hips. A few months later, he was able to walk without sticks and returned to work. He has put on a stone and a half in weight, and now, nearly two and a half years after the treatment, he walks and moves well, and does full-time work in a munitions factory.

*Comment.*—Of the 62 cases, 15 have only been treated during the past six months, so I am not including them in the evaluation of results. Of the remaining 47 cases, 7 are completely free of pain and are leading active and normal lives. Of these, 4 had had symptoms for one to three years, and 3 had had symptoms for more than three years before treatment was begun. One had radiological changes in the sacro-iliac joints only, but the other 6 also showed changes in the lumbar and dorsal spine, so the majority were in Groups II and III of the radiological classification. 38 more patients have improved a great deal, and are now free from continuous pain, but still have occasional twinges in

various situations. Most of these are at work again. The few who are not, are among the more recently treated.

Since in some cases definite improvement has continued even up to two years after the end-of treatment, it is impossible at present to assess what their final condition will be.

There were only two patients in the series who did not benefit from the treatment. One of these shows a hysterical hemi-anæsthesia, and the second did not attend regularly for the treatment.

The conclusions I draw from my observations so far, are that it is worth while treating any patient with ankylosing spondylitis, whatever the stage, except when there is complete ankylosis coupled with entire absence of pain. The treatment by the radio-therapist and physiotherapist in conjunction will usually convert the crippled patient into a useful citizen.

#### REFERENCE

FREYBURG, R. H., SMYTH, C. J., and LAMPE, J. (1941) Roentgen Therapy for Rheumatoid Arthritis of the Spine, *J. Amer. med. Ass.*, 117, 826.

## Demonstration of Apparatus for Self-activated Exercises in the Early Rehabilitation of the Sick and Injured

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As there is considerable confusion of thought between re-education of function, remedial exercises and rehabilitation, it seems desirable to review the use of these terms before proceeding to describe the apparatus.

In the early stages of the *re-education* of function the patient may require help either in the form of manual assistance by a physiotherapist or simple aids such as suspension-slings and pulleys. Such assistance calls for precise technique in order to localize the effort to the weak muscles and to upgrade the strength of exercise as function improves.

The Swedish system of *remedial exercises* is characterized by manual assistance or resistance in which the operator works on the patient rather than by teaching the patient to help himself; but this type of manual and individual treatment cannot be sustained for sufficiently long periods nor can it provide the tempo necessary to make a patient fit for strenuous occupations.

In *rehabilitation* the function of the physiotherapist is to teach the patient to carry out his own exercises, to understand the purpose of the work and to co-operate by stimulating mental as well as physical effort. To this end apparatus has been designed which is activated by the efforts of the patient or a group of patients working together, whilst suspension-slings and springs are employed to localize the muscle work and to give a predetermined degree of assistance or resistance; effort and rest periods alternate in rhythm.

The apparatus consists of a steel frame which can be used in a department, ward or in the open air and may be regarded as a portable gymnasium. Steel springs graded by poundage from 10 to 50 lb. are used to provide "variable" resistance whilst slings permit of the suspension of the whole body or of one limb as required. The apparatus permits also of rope and pulley and pulley and weight "fixed" resistance exercises when desired. The advantages of the apparatus for obtaining self-activated exercises are that it provides a comfortable support and the patient is not afraid of movement; friction and the pull of gravity are eliminated. It permits of relaxation followed by "weightless" and rhythmical exercise. As function improves resistance is added and the patient's effort can be sustained for any desired period, till strong muscle work is achieved.

The clinical application of the apparatus may be illustrated by examples. In spastic paralysis excellent relaxation is obtained as a preliminary to re-education; in flaccid paralysis muscle work can be localized to the affected muscles and contraction of the antagonists eliminated. Progressive movement in painful arthritis or after injury can be obtained with a minimum of muscle work and with the patient confident that movement is under his own control. In orthopædic cases weight and counter-weight of the body itself are used to apply corrective force in deformities; mobility of joints can be maintained after manipulation and, by means of spring resistance, very strong muscle strengthening or "eutonic" exercises are obtained.

A film was shown to illustrate eutonic exercises after abdominal operations and typical exercises were demonstrated on the suspension apparatus.

[Eutonic is a name given to distinguish spring-resistance exercises from other forms of resistance.]