AN ANALYSIS OF 200 CASES OF ANKYLOSING SPONDYLITIS

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In this paper is presented an analysis of 200 cases of ankylosing spondylitis, together with a review of some current ideas on the disease. No attempt is made to cover all its aspects, since the historical and other features have been adequately described by others, notably by Buckley (1945). Data were obtained from the hospital notes of cases admitted to the Royal National Hospital for Rheumatic Diseases, Bath, during the period 1938-48. These do not represent the total number of cases admitted during this period. The records for a number of years were lost as a result of enemy action, and in many other cases the notes were found to be inadequate. Apart from this no selection of cases was made, and the figure was limited to 200 for statistical purposes. All were proved cases of ankylosing spondylitis from both a clinical and a radiological standpoint.

Results of Investigation

Sex Incidence.—There were 158 (79%) males and 42 (21%) females. This percentage of women is higher than has been recorded by other workers, with the exception of Swaim (1939), Gilbert Scott (1942), and Fletcher (1944).

Age of Onset.—The incidence is shown in Table I. In no case did the onset occur before the age of 10 years and in only three cases was it before 15. The results are in conformity with those found by Buckley (1935) and other observers, except that a rather larger number of cases occurred between the ages of 15 and 20.

TABLE I.—Age of Onset

Age	No. of Cases	Percentage
10-20 years	42	21
20-30 "	80	40
30-40 "	45	22.5
40-50 "	21	10.5
50-60 "	11	5.5

In one case the age of onset was not recorded.

Initial Diagnosis.—Only 102 (51%) of the cases were admitted to this hospital with a correct diagnosis already made. This lends further weight to the suggestion of Gilbert Scott (1942) that x-ray examination of the sacro-iliac joints should be a routine investigation in all cases of persistent low-back pain.

Associated Factors

Sepsis.—There was a history or evidence of focal sepsis in 22 cases. This did not include dental caries without abscess formation. The sites of focal sepsis were catholic in distribution, and only three were confined to the pelvis. This is of interest in view of the suggestion made by Buckley (1945) of the importance of infection from the pelvis in this disease.

Trauma.—Thirty (15%) patients gave a history of trauma, which they associated in some way with the onset of symptoms. This trauma varied in severity and anatomical distribution, and the assessment of its significance has proved impossible.

Exposure to Excessive Fatigue and Shock.—Thirteen (6.5%) cases gave a history of this, but taking into consideration the war years and occupational hazards this was not regarded as extraordinary or significant.

Childbirth.—Five of the 42 women patients stated that their symptoms dated from the birth of a child. Others were unaffected by childbirth. A follow-up of this finding might be profitable in view of the pelvic trauma and the physiological changes in the sacro-iliac joints at parturition.

Family History.—In only two cases was there a family history of ankylosing spondylitis. In three cases there was a family history of gout, and 31 revealed a family history of acute or chronic rheumatism.

Past History.—There appeared to be no significant relation between any previous illness and the condition. In only 18 cases was there a history of fibrositis or other rheumatic condition, and in certain of these cases the nature of the complaint seemed vague and of no statistical value.

Occupations.—These were classified as: (1) occupations involving physical effort—heavy 41 (20.5%), medium 92 (46%), or light 32 (16%), and (2) sedentary occupations 30 (15%). In five cases it was not recorded. In this series occupation appears to have little relation to the aetiology of the disease.

Iritis.—In 12 (6%) cases iritis was found. Campbell (1947) and Fritz (1937) report a higher incidence.

Subcutaneous Nodules.—In no case, in spite of a diligent search, were nodules found. In view of their incidence in rheumatoid arthritis this is significant.

Chest Expansion.—In five patients this was more than 3 in. (7.5 cm.), in 20 it was between 2 and 3 in. (5 and 7.5 cm.), in 22 between 1½ and 2 in. (3.75 and 5 cm.), in 27 between 1 and 1½ in. (2.5 and 3.75 cm.), and in 52 less than 1 in. In 74 cases it was not recorded. The vital capacity was estimated in 15 cases with the following results: 5,000-4,000 ml., 1; 4,000-3,000 ml., 2; 3,000-2,000 ml., 5; and below 2,000 ml., 7. In the majority of cases great improvement was noted before discharge. This supports the value of institutional treatment with adequate physiotherapy, especially breathing and postural exercises, and the use of a plaster bed in the acute stage.

Loss of Weight.—Initially 108 (54%) patients were found to have lost weight, in 26 (13%) there was no loss, and in 66 (33%) this point was not recorded.

Type of Onset.—In 62 (31%) cases the onset was acute and of such severity that the patient was confined to bed; in 114 (57%) it was insidious, usually over years; and in 24 (12%) the type of onset was not recorded.

Initial Symptoms.—These consist of pain and/or stiffness; the site in order of frequency is shown in Table II.

TABLE II.—Initial Symptoms

Site	No. of Cases	Percentage
Low back	75	37.5
Low back and other sites	33	16.5
Hips	23	11.5
Low back and hips	20	10.0
Knees	15	7.5
Sciatic pain	12	6.0
Feet and ankles	6	3.0
Cervical spine	5	2.5
Dorsal and cervical spine	4	2.0
Dorsal spine	3	1.5
Hips and knees	1	0.5
Cervical and knees	1	0.5
Shoulders	1	0.5
Unrecorded	1	0.5

Corrected Suspension Stability and Sedimentation Rate.—Abnormal readings at some stage were found in 182 (91%). The grossly abnormal readings were seen when the disease process appeared to be most extensive and most active.

It is our impression that nearly all cases of ankylosing spondylitis will show an abnormal corrected suspension stability and erythrocyte sedimentation rate during the active phase of the disease. The figures obtained in many cases were very abnormal, even more so than those we usually see in rheumatoid arthritis.

Haematocrit.—In 154 (77%) there was a low haematocrit reading. This is in conformity with the view that cases of ankylosing spondylitis show a secondary anaemia during the active phase. Red cell counts supported this in the great majority of cases. White cell counts showed little gross abnormality, but Arneth counts revealed a shift to the left in 20 out of 24 recorded cases.

Blood Proteins.—Plasma protein estimations in five cases showed little gross abnormality except an occasional high total protein figure and a consistently high value for fibrinogen. Albumin, globulin, and the A./G. ratio were always within normal limits. This is in conformity with a larger series done recently in this centre. These results are in contradistinction to the findings in rheumatoid arthritis, in which abnormal plasma proteins were found in approximately 50% of cases (Simpson and Hall Brooks, 1948).

Plasma Uric Acid and Blood Uric Acid.—These were estimated in 178 (89%) cases and were normal in all except four cases in which the figure was slightly raised, but the plasma uric acid was never above 7.5 mg. per 100 ml.

Wassermann and Kahn Tests.—At least one of these tests was done in all cases, and without exception the result was negative.

Alkaline and Acid Phosphatase.—In only 27 cases were these results recorded and in only four were the readings raised—in two the acid phosphatase was 7 and 6.6 units, and in the other two the alkaline phosphatase readings were 15 and 11.5 units (King method). This is in conformity with the opinions expressed by Desmarais (1948), and is of interest in view of the findings of McWhirter (1945) and others.

Muscle Biopsies.—This investigation was carried out in 18 cases and none showed the changes found in rheumatoid arthritis. Muscle biopsies performed in this hospital on cases other than in this series also showed no abnormality as seen in rheumatoid arthritis (Desmarais, Gibson, and Kersley, 1948).

Aurotherapy.—Thirty-six patients had been given courses of gold—20 showed no subjective or objective improvement, in nine there was some subjective improvement, and in seven the results were not recorded.

X-ray Therapy.—It is our custom to give a series of six applications, each of 225 r, in a period of two to three weeks to each affected part. Of 99 cases receiving such treatment 68 showed improvement. This consisted chiefly in relief of pain and stiffness. We find it difficult to say whether the disease process was ever arrested, but we are at present engaged on a follow-up of patients from this point of view and hope to publish the results in the near future. Fourteen cases were not improved from the point of view of pain or any other symptoms. In 17 cases the result was not recorded. We consider that the result of deep x-ray therapy, especially the relief of pain, justifies this form of treatment in all cases, and that it should be initiated as soon as possible.

Radiographic Findings

For the sake of convenience we divided our results into four types (Table III). In type 1 bony ankylosis had occurred, in type 2 gross changes but no ankylosis were found, type 3 showed osteoporosis or other minimal changes alone, and in type 4 there was no abnormality.

TABLE III.—Analysis of X-ray Findings

	Total	Type 1	Type 2	Type 3	Type 4
Sacro-iliac joints ..	173	155	18	0	0
Lumbar ..	167	138	7	16	6
Dorsal ..	120	75	10	23	12
Cervical ..	88	65	7	4	12
Hips ..	141	28	46	27	40
Shoulders ..	12	0	2	9	1
Knees ..	14	4	4	5	1
Hands ..	32	0	2	11	19
Feet ..	4	0	0	3	1
Ankles ..	1	0	0	1	0
Symphysis pubis and ischium ..	21 showed "woolliness"				

Discussion

Certain workers, notably in the U.S.A., favour the concept that the disease is a variant of rheumatoid arthritis (Boland and Present, 1945; Lennon and Chalmers, 1948). From a study of this series of cases we regard it as a separate entity. Our reasons for so doing are: (1) in no case has a subcutaneous rheumatic nodule been found; (2) muscle biopsies have never shown the changes associated with rheumatoid arthritis; (3) plasma protein values are not similar to those seen in rheumatoid arthritis; (4) the high incidence in males, the beneficial effect of deep x-ray therapy, and the ineffectiveness of chrysotherapy are unlike the findings in rheumatoid arthritis; (5) the x-ray appearances as seen in the spine, hands, and other joints are unlike those normally seen in typical rheumatoid arthritis; and (6) permanent deformities typical of rheumatoid arthritis were not present in the hands or feet in any case in this series.

In 75 (37.5%) cases the initial symptom was pain and/or stiffness in the low back. In 53 (26.5%) other cases symptoms were referable to the low back and other sites concurrently. Initial peripheral joint involvement (elbows, wrists, hands, knees, ankles, feet) accounted for 21 (10.5%) cases. In 12 (6%) peripheral joint involvement occurred initially in combination with involvement of other joints. This is of interest in view of the findings of peripheral joint involvement by Boland (1946) and Boland and Shebesta (1946), whose figures vary between 18 and 30%.

An analysis of our x-ray results shows agreement with the views expressed by other authorities, especially Steven (1947). It will be noted that bony ankylosis had occurred in 155 of the 173 cases in which x-ray films of the sacro-iliac joints were available. This shows that in the majority of our cases we were dealing with the advanced stage of the disease, but earlier x-ray films were available of a certain number of these cases before ankylosis had occurred. We are agreed that the earliest changes seen radiologically are osteoporosis of the affected bones (sacrum and ilium) and a subarticular zone of osteosclerosis. We are not clear which of these changes is primary or whether they occur simultaneously.

The next most frequent site to be involved is the lumbar spine. There was no case in this series in which we found involvement of the lumbar spine without involvement of the sacro-iliac joints. In one case, in the early stages, unilateral involvement of the sacro-iliac joints was seen; later films revealed bilateral changes. We are impressed with the frequency with which the articulation between D12 and L1 is involved. This probably is secondary to the considerable stress at this joint.

The radiological changes at other sites generally corresponded with the severity of the disease and the location of the symptoms. In only two of the 32 cases in which the hands were x-rayed was there evidence of extensive changes. These consisted of translucent areas in the shafts of the metacarpals and phalanges (unlike the erosions seen

in rheumatoid arthritis), together with a generalized osteoporosis. In 11 cases osteoporosis alone was seen, and in 19 nothing abnormal was detected. The osteoporotic and other changes were associated with a severe and widespread phase of the disease, but in no case did we see changes characteristic of rheumatoid arthritis.

The biochemical and haematological data are self-explanatory and agree with the findings of other workers.

Summary

Two hundred cases of ankylosing spondylitis are reviewed.

Sex incidence, age of onset, associated factors, accuracy of original diagnosis, occupation, and family and past histories are enumerated.

The original symptoms and type of onset are described, as are the biochemical and haematological findings.

The nature of the disease process is discussed, especially in its relation to rheumatoid arthritis, and we conclude that it is a separate entity.

The analysis of the x-ray findings is discussed.

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REFERENCES

- Boland, E. W. (1946). *Calif. Med.*, **65**, 285.
 — and Present, A. J. (1945). *J. Amer. med. Ass.*, **129**, 843.
 — and Siebesta, E. M. (1946). *Radiology*, **47**, 551.
 Buckley, C. W. (1935). *Reports on Chronic Rheumatic Diseases*, **1**, 77.
 — (1945). *Ann. rheum. Dis.*, **5**, 49.
 Campbell, A. M. G. (1947). *Lancet*, **1**, 406.
 Desmarais, M. H. L. (1948). *Ann. rheum. Dis.*, **7**, 105.
 — Gibson, H. J., and Kersley, G. D. (1948). *Ibid.*, **7**, 132.
 Fletcher, E. (1944). *Lancet*, **1**, 754.
 Fritz, H. (1937). *Ther. d. Gegenw.*, **78**, 457.
 Lennon, W., and Chalmers, I. S. (1948). *Lancet*, **1**, 12.
 McWhirter, R. (1945). *Brit. J. Radiol.*, **18**, 302.
 Scott, S. G. (1942). *Adolescent Spondylitis*. London.
 Simpson, N. R. W., and Brooks, D. Hall (1948). *Proc. R. Soc. Med.*, **41**, 609.
 Steven, G. D. (1947). *Ann. rheum. Dis.*, **6**, 1.
 Swaim, L. T. (1939). *J. Bone Jt Surg.*, **21**, 983.

SIGNIFICANCE OF CLUBBING OF THE FINGERS

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Perhaps we are rather too apt to regard clubbed fingers as dire omens. Lovibond (1938) stated: "The discovery of clubbed fingers is condemning to the patient . . . long known to be associated with grave disease." Familial clubbing, however, without clinical significance, in which the inheritance is of Mendelian dominant type, is well recognized (Horsfall, 1936; Seaton, 1938; Mendlowitz, 1942; Davis, 1946), although Witherspoon (1936) found only 14 families reported in the literature. Mendlowitz gave an exhaustive list of conditions associated with clubbing, at the same time pertinently remarking that "mere coincidence in isolated cases is not sufficient evidence of a causal relationship." Among associated conditions of less serious import he included simple deformities of the chest wall and uncomplicated emphysema and bronchitis, although these associations were rare. He even quoted "idiopathic," apparently non-familial, cases in quite healthy people (Campbell *et al.*, 1938; Becher, 1941).

In the course of a few months several people were seen whose fingers and toes were clubbed but who suffered from no ominous disease. Brief examples follow.

Cases without Ominous Disease

Case 1: Chest Deformity (? Congenital).—A soldier aged 33 was admitted to hospital with tonsillitis. His fingers and toes were markedly clubbed. He was sure that they had always been that shape, but knew of no similar ones in the family. He had no history, symptoms, or signs of lung or heart disease, and all investigations were negative. He also had a deformity of the chest wall on the right side involving ribs 6, 7, and 8, which were concave in the anterior axillary line, producing a considerable hollow. This had also been present all his life.

Case 2: Familial.—A sergeant-major was admitted to hospital for investigation of his headache (migrainous). He had gross clubbing of the fingers and toes, and also an apparently congenital varus deformity of the fifth toes. There was no history referable to chest complaints; full investigations were negative, and had been so previously at another hospital. He knew he had had clubbing for at least 20 years, and said that his son, aged 2, had had exactly similarly shaped fingers and toes since birth. Another interesting fact was that three of his sisters were said to have died from pneumonia. There was no tuberculous disease in the family.

Case 3: Familial.—A man aged 41 was admitted for investigation of his dyspepsia. He had no history of chest disease, but his fingers and toes were clubbed. His two children, aged 5 and 2, were normal in this respect, but his mother's digits were also clubbed. He had no brothers or sisters.

Case 4: No Apparent Associated Condition.—A middle-aged man came to the out-patient department with a fractured finger. All his fingers were clubbed and, he thought, had always been so shaped. He had no history or symptoms of medical disease, investigations were negative, no congenital abnormalities were discovered, and there was no family history of clubbing.

Case 5: Emphysema.—A man aged 62 was admitted for investigation of his sciatic pain. For many years he had had some winter cough and shortness of breath. He had clubbed fingers and toes and fairly marked emphysema, but no disease of the chest beyond this could be discovered after full investigation.

Case 6: ? No Associated Condition.—An airman aged 21 was admitted with mild febrile laryngitis and bronchitis. He rapidly recovered, but continued to complain of a cough, which was quite dry, some shortness of breath, and vague chest pains. There were no abnormal signs whatsoever except for clubbing of the fingers, which had been present at the beginning of his mild illness. Full investigations were negative.

Case 7: Chronic Bronchitis.—An airman aged 36 complained of a chronic cough all the year round since he was 10, when he had had pneumonia. He had some white sputum in the mornings and some dyspnoea on exertion. Examination revealed nothing at all beyond gross clubbing of the fingers and toes. Bronchography was normal.

Case 8: Past Chest Disease.—An airman aged 30 gave a history of pneumonia at the right base at the age of 5. When 17 he had been in a sanatorium for six months with tuberculosis of the right lung, which had been pronounced cured, and the patient had remained tubercle-free since. He had had rather doubtful attacks of "bronchopneumonia" (? site) since this, and frequent bronchitis with greenish sputum but no blood. On examination he was undersized—5 ft. 6 in. (1.68 m.) in height—and looked much younger than his 30 years. He had clubbed fingers and some flattening of the right suprascapular region only. X-ray films of the chest and bronchography were perfectly normal.

Comment.—Certain points arise. In Case 1 the clubbing might be the result of the congenital chest deformity; but might it not be an associated congenital abnormality?—especially as Case 2 also showed a congenital skeletal deformity which could only be an associated condition. Could there be any relation between the familial clubbing in Case 2 and the sisters' pneumonia? Case 8 was interesting in that the clubbing was presumably related to past chest disease, had not subsided with healing of the lungs, and was associated with infantilism. Case 6 had been