Rheumatoid (Marie-Strumpell) Spondylitis

Technique of Examination and Importance of the Costal Joints

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SUMMARY

Rheumatoid spondylitis in the early prodromal stage may present a complex and obscure clinical picture making diagnosis difficult. It is in this early stage that roentgen examination of the small joints of the spine will often aid in or lead to the correct diagnosis of the disease in which the classical clinical symptoms and roentenographic findings in the sacroiliac fissure have not appeared and may never appear. The changes in these small joints, particularly in the costovertebral and costotransverse joints, are less obvious and require experienced and careful interpretation, but it is to these that the roentgenologist must direct his attention if he is to be of assistance in early diagnosis. A technical procedure for this examination is presented, along with a discussion of the clinical importance of changes at this site.

Demonstration of involvement of the sacroiliac joints is of diagnostic importance, but this finding is no more necessary to the diagnosis of rheumatoid spondylitis than is involvement of any other single joint of the spine. Insistence on sacroiliac involvement will often result in missed diagnosis, and has led in part to erroneous conclusions as to sex incidence of the disease.

RHEUMATOID spondylitis is a chronic progressive disease characterized by lesions of the small joints of the spine and ribs, and of the sacroiliacs, by youth at the onset,[14] and by a tendency to progress to spinal ankylosis. The cause is not known, but it presents many features common to infectious disease, and it is thought by some, probably correctly, to be unrelated to rheumatoid arthritis or arthritis deformans. It is one of the common diseases of mankind, and is to be suspected in those cases in which there are unexplained peripheral and visceral pains, elevated temperature and increased blood sedimentation rate, even though the late classical manifestations of back pain, limitation of motion of the spine and roentgenological evidence of the disease in the sacroiliac joints have not yet appeared.

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Although many observers have reported that rheumatoid spondylitis is preponderantly a disease of males, in the author's experience it was found to affect about as many women as men. In a series of 151 patients with rheumatoid spondylitis who were treated by the author in 1946-47, 76 were males and 75 females; and of 97 untreated patients observed, 53 were males and 44 females. In all these cases, the disease was diagnosed by clinical and radiographic studies, and none by radiographic study alone. Possibly because of architectural differences and usually less vigorous physical activity, females are less prone to develop sacroiliac changes, and much less commonly reach the clinical "spondylitic" stage. This will account, in part at least, for the wide disparity in reports of sex incidence in which there is a variance of 13:1 male[17] to 1:1 reported herein.

Seven[15] stated in 1903 that the first change in rheumatoid spondylitis is a synovitis of the small posterior intervertebral or apophyseal joints, and that in those cases in which the lumbar spine was attacked, the sacroiliac joints might become involved. Simmonds[16] and Fraenkel[7] described changes in the apophyseal joints in 1904. Oppenheimer[12] observed that the most important spinal joints, the apophyseal, receive little or no attention from orthopedists, radiologists or rheumatologists. They are true diarthrodial joints, and differ almost as much from the sacroiliac joints as do the hip joints. Passing references concerning involvement of the costal joints have been made by a number of observers, but while changes at these sites are extremely important diagnostically and in the disabling effects of the disease, little effort has been made to show these joints by roentgen study.

The costotransverse and costovertebral joints can be well visualized only in an anterior-posterior projection, with the central ray directed 20 degrees cephalad and centered between the fifth and seventh thoracic vertebrae (Figure 1). In large-boned individuals a right and left 10 degree medial oblique cephalic projection may be necessary to outline the costovertebral joints. The conventional 90 degree anterior-posterior projection of the thoracic spine does not outline these joints well, and inaccuracies of interpretation may occur in any but advanced cases.

In a detailed study of over 500 cases of rheumatoid spondylitis in all stages, it was observed that in the great majority the earliest x-ray evidence of joint involvement was to be found in one or more of the costal or apophyseal joints. Rarely were the costal and apophyseal joints regarded as normal

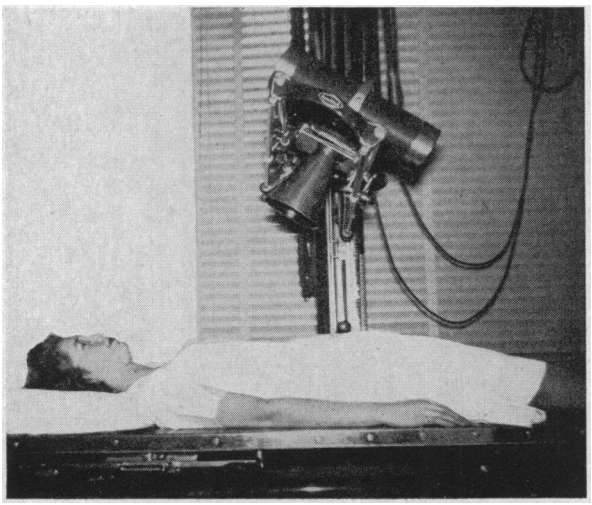

Figure 1.—Costal joints show best by an anterior-posterior 20° cephalad oblique, centered through the fifth to the seventh dorsal vertebrae.

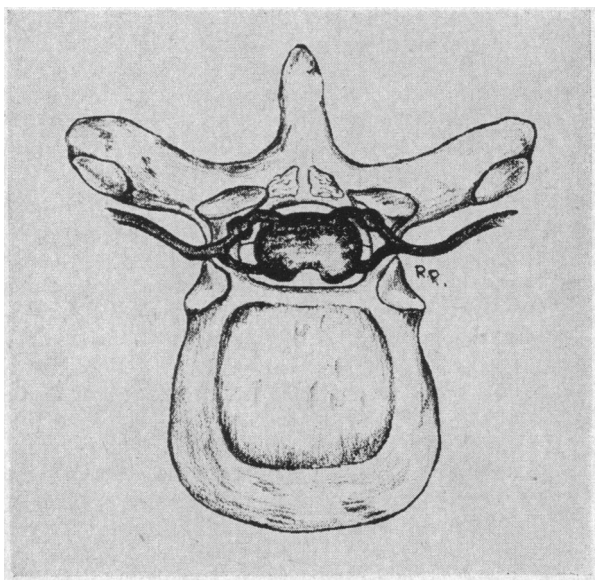

Figure 2.—Inferior surface, mid-dorsal vertebrae, showing apposition of the spinal nerve roots to the costal and apophyseal joints.

when the sacroiliac joints showed the changes considered characteristic, and regarded by most observers[2, 14, 9] as the earliest findings in rheumatoid spondylitis. Also, in many cases, particularly in females, advanced changes were found in these small joints when the sacroiliac joints appeared to be normal. This is logical if one is to assume that the most common of the prodromal symptoms in the "pre-spondylitic stage" of Scott[14]—pain, local or referred to the extremities, abdomen, or thorax—is caused by reflex or direct root irritation of the spinal nerve trunks, which are closely apposed to the involved joints (Figure 2). Oppenheimer,[13] in reporting on a total of 50 cases, in all of which characteristic apophyseal changes were noted, said that there was sacroiliac involvement in only 86 per cent of the total, and in only 60 per cent of those cases in which the apophyseal changes were in an early stage. Buckley,[4] Gordon,[8] Forestier[6] and others have reported cases in which the sacroiliac joints were not involved. Borak[3] concluded that the changes in the sacroiliac joints commonly associated with rheumatoid spondylitis are degenerative and are caused by increased torsional strain produced by stiffness of the lumbar spine, and are not the direct result of the disease.

Actually, the long fissure between the sacrum and ilium, commonly termed "sacroiliac joint," has two components: the true cartilaginous joint which occupies about the lower anterior third of the fissure, and the balance a fibrous synostosis without synovia. Since rheumatoid spondylitis originates as synovitis, it follows that the changes demonstrated by x-ray in the sacroiliac fissure are of two types: one, actual involvement limited to the true joint, and the other, seen equally often, a secondary degeneration of the fibrous ligaments joining the two bones. This latter finding is seen not uncommonly in one, and less often in both sacroiliac joints in long standing cases of spinal malalignment or fixation from any cause.

First, synovitis and exudation into the joint occur. In this stage, x-ray findings are usually absent. Next, an infiltration of small round cells develops, and an invasion of connective tissue starts. Here, the x-ray findings of clouding of the joints and loss of definition and irregularity of the articular surfaces, and sometimes periarticular or generalized osteoporosis, appear. The latter is extremely difficult to determine unless well developed. The apophyseal and costal joints are probably never involved in the initial stages simultaneously; rather, the process begins in one or more joints, and may remain localized, or others may be involved successively, so that it is usually possible, in all but very early or late cases, to see many stages of the disease in an individual case (Figures 3, 4).

These changes may occur without the appearance of the clear-cut local manifestations of pain, tenderness and limitation of motion considered by many to be characteristic of the disease. (A rapid sedimentation rate is present during exacerbation in between 80[1] and 90[10] per cent of cases, and a high spinal fluid protein content—45 to 121 mg. per cc.—may be found.) It is in these early stages, because the symptoms may be so variable in both location and severity, that the clinical diagnosis is difficult; and patients have been diagnosed as having subdeltoid bursitis, hip joint disease, pleurisy, sciatica, renal colic, intercostal neuritis, "acute surgical abdomen" (in severe acute cases), and herniated disc.[5] To these erroneous diagnoses are added, from the author's experience, coronary artery disease, psychogenic backache, psychoneurosis, rheumatic fever, acute pancreatitis, gall bladder disease, and appendicitis and herpes zoster.

Rarely, tuberculosis, coccidiomycosis, brucellosis and pyogenic infections may produce similar changes. The lumbar apophyseal joints show a sim-

ilar appearance secondary to disc degeneration, one segment above and at the disc level, in about 20 per cent of cases. Hypertrophic osteoarthritis commonly involves these joints; in this disease the joint space appears to be narrowed but remains clear, the articular surfaces are smooth, and there is marginal spurring and dense sclerosis of the articular surfaces (Figure 5). Frequently, in the third decade of life and after, a combination of the two types is seen.

In the later stage the findings become more definite. Articular surfaces become eroded and serrated, cartilage is replaced by connective tissue, the joint space becomes dense and is finally obliterated by bony proliferation, subarticular sclerosis develops, and fibrocystic degeneration may be seen around the joints, and they become completely ankylosed.

In the final stage of rheumatoid spondylitis, which is seen proportionately rarely, the "bamboo" spine caused by calcification in the longitudinal ligaments and annulus of the disc[11] appears. At this time, the patient is stooped, with all spinal and rib cage movements frozen—the typical spondylitic wreck (described by Scott[14]) who might have been salvaged if proper diagnosis had been reached early and treatment begun immediately.

The author is in accord with Comroe's[5] dictum that "it is good medical practice to always perform a sedimentation rate and x-ray the low back and sacroiliac joints when a patient complains of vague aches and pains in the back or extremities," but to it would add: x-ray the costal and lumbar apophyseal joints when a patient complains of unexplained abdominal or thoracic pains and/or vague aches and pains in the back or extremities.

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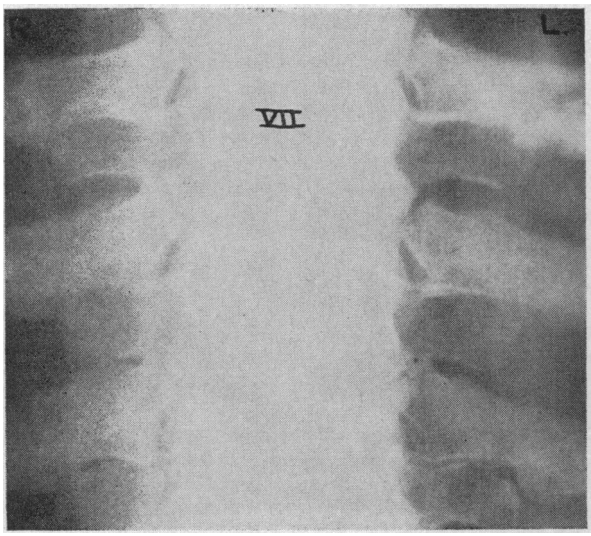

Figure 3.—(M.N.): Female, age 32. Vague chest and precordial pains intermittently ten years. Bilateral narrowing, haziness and loss of joint definition, 7th and 8th, slight haziness 10th left, normal 10th right, costotransverse joints. Narrow and hazy 9th costovertebral. Others, normal. Sacroiliacs normal.

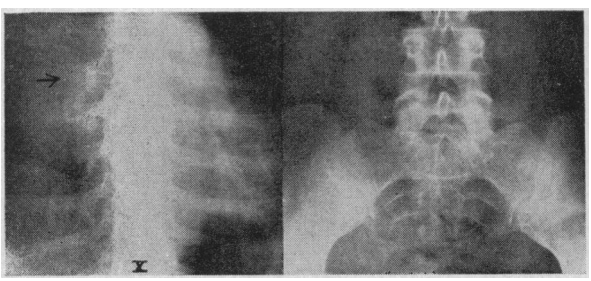

Figure 4.—(F.H.): Female, age 42. Vague intermittent pains until injury one year ago, followed by onset of severe back pains, and stiffness. Varying degrees of involvement of the costotransverse joints, with complete ankylosis of that of the fifth, right. Minimal changes right sacroiliac joint. Completely relieved of symptoms following two series of treatments.

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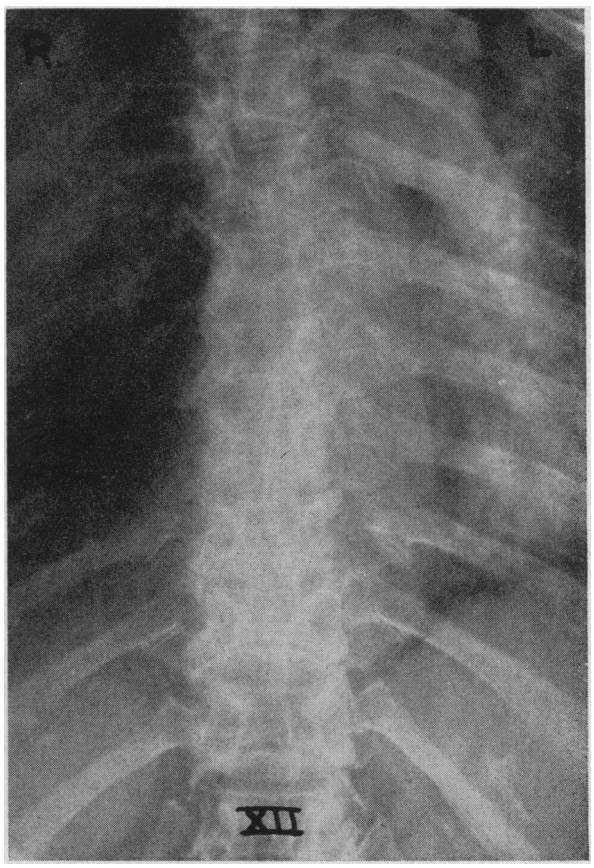

Figure 5.—(M.A.): Female, age 38. Bilateral radiating chest and upper abdominal pains intermittently for years. Hypertrophic osteoarthritis (degenerative) of the ninth left and tenth bilateral costotransverse joints. Joint spaces clear. Sub-articular sclerosis and spur formation. Normal clear costotransverse and costovertebral joints of the ribs above 9 and 10.

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Discussion by EDWARD W. BOLAND, M.D., *Los Angeles*

Dr. Williams is among the first to report detailed roentgenographic studies of the costovertebral joints in rheumatoid spondylitis. Heretofore most attention has been directed toward those changes which occur in the sacroiliac and apophyseal joints, and in the paravertebral ligaments. Yet the costovertebral joints are deserving of consideration because involvement of them leads to some of the most distressing clinical manifestations of the disease, namely, chest pain particularly on inspiration, possibly so-called girdle pains, fixation of the thoracic cage in an expiratory position with flattening of the anterior chest wall, diminished pulmonary excursion with reduction of vital capacity and exertional dyspnea.

Dr. Williams' statistics on sex incidence are at variance with those published by others. Almost all investigators have agreed that rheumatoid spondylitis has a predilection for males, the sex ratio varying in different series from 6:1 to 20:1. In my own private practice the ratio has been approximately 4 males to 1 female. The disparity between Dr. Williams' statistics and those of others may be explained perhaps by differences in criteria for diagnosis.

At the Army Rheumatism Center, Army & Navy General Hospital, I had opportunity to study a large number of soldiers with this disease. In one period of two years, for example, 1,084 patients with rheumatoid spondylitis were admitted. These comprised 18.1 per cent of 6,000 consecutive admissions for rheumatic disease during that period. Some of my observations and conclusions differed from those presented here by Dr. Williams.

In the vast majority of those patients (80 per cent) the first symptoms began in the lower back. These usually consisted of aching and stiffness, at first recurrent but later persistent. Sometimes sharp pains or "catches" in the buttocks, hips or lower back constituted the first complaints. Intermittent sciatic pain, often alternating from side to side, was present in about 10 per cent of early cases. Much less frequently (20 per cent) were the first symptoms located at higher levels (lumbar, thoracic or cervical segments).

Dr. Williams has stated that females are less prone to develop sacroiliac involvement and that in them the early pathologic changes more often begin higher in the spine, in the costovertebral and apophyseal joints. In my experience, the majority of women have the first clinical manifestations in the lower back, although the percentage may be somewhat lower than in men. A word of caution should be inserted here: An unequivocal diagnosis of rheumatoid spondylitis, even in females, should be made with hesitation unless characteristic alterations are present roentgenographically in the sacroiliac and/or apophyseal joints. X-ray evidence of bilateral sacroiliitis is almost pathognomonic of rheumatoid spondylitis. But when the sacroiliac joints are roentgenographically negative, clinical criteria should be at hand before the diagnosis of spondylitis is definitely made. These criteria include characteristic symptoms and physical findings, elevated erythrocyte sedimentation rate, or perhaps coexisting rheumatoid arthritis in peripheral joints.

In experience among soldiers, the earliest roentgenographic alteration were almost invariably located in the sacroiliac joints; certainly the sacroiliac changes were the most diagnostically reliable. Shebesta and I made a special study attempting to correlate the clinical and roentgenographic changes in 50 cases. Detailed clinical appraisal and exhaustive roentgenographic studies of the spinal joints were accomplished. Even when there were clinical signs of lumbar and thoracic involvement in early cases the apophyseal joints more often appeared normal, or at most questionable. Almost always the sacroiliac findings were more definite and of more diagnostic value. In some cases of longer standing, paravertebral ligament calcification was present before diagnostic changes in the apophyseal joints had occurred. We concluded that alterations in these articulations were quite inconstant and often late in appearing. For practical diagnostic purposes changes in the sacroiliac joints were found much more reliable in early cases. We made no special study of the costovertebral joints.

Moreover, we believed that the severity of the spondylitis, as appraised clinically, was often reflected by the character of the sacroiliac changes. In mild cases, juxta-articular sclerosis and narrowing of the joint were the predominant features; subchondral rarefaction was minimal and joint mottling was not prominent. In moderate cases, observed before ankylosis, subchondral rarefaction and sclerosis were present in fairly equal proportions, and mottling of the joint was definite. In severe cases, juxta-articular rarefaction and joint destruction were extreme; subchondral sclerosis was not so conspicuous.

As Dr. Williams has suggested, roentgenographically demonstrable alterations in the joints of the spine result from destruction of articular cartilage and from alterations in juxta-articular bone. When the pathologic process is restricted to the synovial membranes, roentgenograms are negative (swelling resulting from synovial effusion into the spinal joints cannot be visualized roentgenographically). As in peripheral rheumatoid arthritis, it may take months or years to develop sufficient cartilaginous or osseous alteration to be recorded on roentgenograms; the pathologic changes in some joints may never progress sufficiently to show positive x-ray findings. Therefore there is almost always a time lag between the development of localizing physical signs and the appearance of roentgenographic abnormalities. For example, x-ray changes in the sacroiliac joints may not appear for months or even years after the onset of back symptoms. Similarly, the patient may complain of pain, aching and stiffness and demonstrate local tenderness, muscle spasm and limitation of motion in the lumbar, dorsal or cervical regions for months or even years before the apophyseal joints show roentgenographic abnormalities.

The degree of extension may be much more accurately appraised by clinical than by roentgenographic criteria. Involvement clinically is often one or two segments higher than is evident roentgenographically.

This fact is important when the prescription for roentgen therapy is written. Obviously the selection of segments for treatment should depend mostly on the extent of clinical involvement if all actively diseased areas of the spine are to be treated.

DR. WILLIAMS (closing): Dr. Boland, by his careful and very extensive investigation of a large series of cases and his many publications on the subject, has added much to the knowledge of this disabling disease. While at variance on some of the aspects of the x-ray findings, I am sure that we can agree wholeheartedly on one point, and that is the value of early diagnosis. This is extremely important to the patient for two reasons. First, that he can be given advantage of every type of treatment available, of which x-ray is probably the most effective. Secondly, he can avoid the expense and disappointment of missed diagnosis and misdirected treatment. I have listed the errors of diagnosis given by Comroe and in those cases that I have seen. Of all these, psychoneurosis is the most difficult for the patient to accept. It requires more painstaking and experienced study of roentgenograms of the small joints of the spine and ribs than of the sacroiliacs, but the results obtained more than justify the effort, for it is here that early evidence of the disease is found, and usually long before the sacroiliac joints present discernible changes.