Spinal bony bridging and carditis in Reiter's disease

J. M. CLIFF

Royal Naval Hospital, Plymouth

Hans Reiter (1916) described the case of a young soldier who developed both urethritis and conjunctivitis 8 days after the onset of a bloody diarrhoea; 2 days later joint pains appeared and these were followed by a stormy course lasting 13 weeks in which there was fever, polyarthritis, and iritis, but the final outcome was not recorded. Since that time the syndrome of urethritis, conjunctivitis, and arthritis has been commonly known as Reiter's disease or Reiter's syndrome. Reiter was not the first or even a very important observer of this syndrome, Sir Benjamin Brodie having described five cases 98 years earlier (Brodie, 1818), but his name is much used in the English-speaking world just as the names of Feissinger and Leroy are used on the continent of Europe (Feissinger and Leroy, 1916). In fact there are 27 synonyms, eponyms, or descriptive titles (Hancock and Mason, 1965), and the literature increases rapidly with 251 references in the latest review (Weinberger, Ropes, Kulka, and Bauer, 1962).

As it is known in the United Kingdom and North America, Reiter's disease appears to be a sequel to so-called 'non-specific urethritis', while on the Continent there is an association with a bacillary form of dysentery; it might therefore be possible to postulate a venereal and a post-dysenteric syndrome. The disease rarely presents in more than one member of a family (Csonka, 1958; Mowat and Nicol, 1968) but the relatives may have chronic rheumatic disease, particularly rheumatoid arthritis (Csonka, 1969); genetic factors may therefore play some part in the development of the condition.

In the present state of our knowledge Reiter's disease is a syndrome of as yet unknown aetiology occurring predominantly in males with the two most common features of non-specific urethritis and non-suppurative migratory polyarthritis with less frequent conjunctivitis, iritis, circinate balanitis, and keratoderma. Initial attacks usually burn themselves out, but the annual risk of a second attack is about 15 per cent. (Csonka, 1960) and chronicity then may

ensue with recurrent anterior uveitis, painful mutilating deformities of the feet, atypical spondylitis, heart block, and an unusual aortic valvular lesion leading to aortic incompetence. The joints of the lower limbs are particularly involved but the hips tend to be spared; where there is relapsing uveitis the sacroiliac joints are most commonly involved.

Cardiac involvement in the acute stages of Reiter's disease has been described by several authors in recent years (Feiring, 1946; Warthin, 1948; Trier, 1950; Mayne, 1955; Csonka and Oates, 1957; Neu, Reider, and Mack, 1960; Weinberger and others, 1962), the most common findings being a prolongation of the PR interval with variable flattening of the T wave. Paronen (1948) published his observations on 344 post-dysenteric cases of Reiter's disease and there were twenty subjects with abnormal electrocardiograms out of 308 patients examined in this way (6.5 per cent.); the changes disappeared quite rapidly in all but four cases and a follow-up of 100 patients from this series after an interval of about 20 years revealed only two abnormal cases, one with cardiac insufficiency and one with total heart block (Sairanen, Paronen, and Mähönen, 1969).

This acute form of cardiac involvement during the initial illness would therefore appear to be self-limiting in all but the most unusual case, and entirely unlike those examples of Reiter's disease in which there is no electrocardiographic change for many years after which there is the slow progression of a conduction defect with or without the development of an aortic valvular lesion due to dilatation of the aortic valve ring. Csonka, Litchfield, Oates, and Willcox (1961) described three definite and one possible case of aortic incompetence in Reiter's disease and five other cases were reported in 1963 to 1964 (Pearson, 1963; Zvaifler and Weintraub, 1963; Rodnan, Benedek, Shaver, and Fennell, 1964).

The unusual type of spinal bony bridging seen in Reiter's disease was noted by Weldon and Scalettar (1961) and further reported by Montgomery, Poske, Pilz, Barton, and Foxworthy (1963), Good (1965),

and Peterson and Silbiger (1967). Its association with an aortic valvular lesion was described in one case by Rodnan and others (1964).

Case reports

CASE 1

This man first presented in 1952 at the age of 37 with a non-specific urethritis occurring very shortly after his marriage; he had had gonorrhoea in 1938 and a previous non-specific urethritis in 1945. Within 2 weeks of this latest infection he developed a polyarthritis with an effusion into the left knee joint, pain and swelling of both feet, and a diffuse backache. Investigation showed erythrocyte sedimentation rate (Wintrobe) 40 mm. in 1 hr; antistreptolysin O titre, latex-fixation test, and Wassermann reaction negative. The dorso-lumbar spine was radiologically normal. In spite of courses of treatment with parenteral penicillin, aureomycin, and artificial fever therapy (intravenous TAB), the symptoms and

signs did not remit for 4 months; 6 months later there was an effusion into the right knee joint which settled spontaneously.

In 1957 a collapsing pulse was noted at routine examination and there was clinical evidence of an aortic reflux; an electrocardiogram (ECG) (Fig. 1) was normal. He continued to remain well apart from variable pains in the neck, shoulders, and buttocks. In 1959 further x-rays of the dorso-lumbar spine showed 'skip' bony bridging (Fig. 2) which spared the lower lumbar spine and the anterior spinal ligament; the sacroiliac joints were normal and there was no spur formation or periosteal reaction in either calcaneal bone. When he was seen in 1961 the ECG was again normal but in 1964 he was having attacks of cardiac asthma and the ECG now showed a bundle-branch block picture although the PR interval remained within normal limits (Fig. 1). In spite of digitalization his cardiac state deteriorated further in 1965 when he had a febrile illness; a diagnosis of subacute bacterial endocarditis was made on clinical grounds and

FIG. 1 Case 1. Electrocardiogram on November 29, 1957 (normal) and on November 23, 1964 (bundle-branch block.)

FIG. 2 Case 1. Bony bridging lesions in dorsal spine and at dorso-lumbar junction (1959).

there was an apparent response to a course of oral chloramphenicol but the blood cultures proved to be sterile. He died in left ventricular failure $13\frac{1}{2}$ years after the onset of his original Reiter's disease.

Post-mortem findings

At a limited *post mortem* examination, when only the heart and great vessels were examined, there was marked atheroma of the aorta, and the aortic valve ring was found to be dilated with thickening of the aortic valve cusps. Microscopical examination showed that the atria and ventricles were normal but that in the aortic valve ring there was dense connective tissue with collagen replacement of muscle and numerous inflammatory foci consisting of lymphocytes with occasional plasma cells,

FIG. 3 Case 1. Aortic valve ring, demonstrating an inflammatory focus composed of lymphocytes with occasional plasma cells, monocytes, and neutrophil polymorphonuclear leucocytes. $\times 200$.

monocytes, and neutrophil polymorphonuclear leucocytes; in some areas the distribution of the inflammatory cells was perivascular (Fig. 3).

CASE 2

This man first came to notice in 1955, at the age of 36, when he complained of pains in the left foot and fleeting pains in the right thumb, left knee, and dorso-lumbar spine. X-ray examination of the spine and affected joints was normal. During succeeding years there was increasing spinal stiffness with progressive discomfort in both feet so that, by 1964, he could only walk with difficulty. He had the first of several attacks of anterior uveitis in 1963 but he always denied a history of urethritis.

At review in 1964, spinal movement was much restricted by pain, there was swelling of the right thumb, and a bilateral plantar fasciitis was present; at the same time the first clinical evidence of aortic incompetence was

FIG. 4 Case 2. Lumbar spine and sacroiliac joints (1964), showing doubtful sclerosis of sacroiliac joints and new bone formation on the left of L5. No spinal bridging lesions.

FIG. 5 Case 2. Left calcaneal bone (1970), showing prominent plantar spur and marked periosteal reaction.

noted. Blood pressure 125/70. Differential agglutination test and Wassermann reaction negative. ECG normal with PR interval 0.2 second. X-ray examination now showed erosion of the base of the right first metacarpal bone; there was doubtful sclerosis of the sacroiliac joints with periosteal new bone formation on the iliac crests and pubic rami, but the lumbar spine appeared normal apart from new bone formation on the left of the fifth lumbar vertebra (Fig. 4).

In 1967 there were continuing signs of a bilateral plantar fasciitis with deformity of several metacarpo-

FIG. 6 Case 2. Dorso-lumbar spine (1970), showing prominent bridging lesions in dorsal spine and an early lesion between second and third lumbar vertebrae on right side; sclerosis of sacroiliac joints.

phalangeal joints, the clinical cardiological findings were unchanged but a further ECG showed that the PR interval had extended to 0.24 second. Radiological examination now showed undoubted sclerosis of the sacroiliac joints with an early bridging lesion between the second and third lumbar vertebrae on the right side but no calcification in the anterior spinal ligament; there was further erosion of the head of the right third metacarpal bone while the calcaneal bones showed prominent plantar spurs with a florid periosteal reaction (Fig. 5).

The latest clinical report (1970) is that he remains at work but has symptoms of a hiatus hernia. X-ray examination shows extensive 'skip' bridging lesions in the dorsal spine and especially at the dorso-lumbar junction (Fig. 6, opposite), but the anterior spinal ligament remains

uncalcified. The erythrocyte sedimentation rate has always been within normal limits.

CASE 3

This man first presented in Canada in 1944 at the age of 27 with urethritis, low back pain, and a painful right heel. X-ray examination of the lumbar spine, sacroiliac joints, and feet was reported as normal but he was found to have a prostatitis which was treated. In 1945 he had a relapse of symptoms when diagnoses of lumbar fibrositis and plantar fasciitis were made. In 1950 a complaint of low back pain was associated with the radiological finding of a spur uniting the eleventh and twelfth dorsal vertebrae on the left side (Fig. 7). At that time there was a recurrence of the urethritis with swelling over the left fifth toe and radiological evidence of erosion of the head of the left fifth metatarsal bone; a diagnosis of Reiter's disease was made for the first time. Later in 1950 a further relapse of urethritis coincided with swelling of the small joints of the left hand. There was then a remission until 1956 when he presented with urethritis and conjunctivitis, subsequently developing effusions into both knees and painfully stiff feet. There were no abnormal cardiac signs but an ECG was not recorded. Further x-ray examinations showed a spread of the 'skip' bridging lesions in the dorsal spine (Fig. 8, overleaf) with minimal calcification apparent in the anterior spinal ligament. There was radiological evidence of absorption of the head of the left fifth metatarsal bone and a marked periosteal reaction in the left second and third metatarsophalangeal joints (Fig. 9, overleaf).

In 1964 he complained of breathlessness on exertion; he had been separated from his wife for 5 years and had had no further episodes of urethritis. At this time he was found to have an aortic diastolic murmur; blood pressure 125/65. The latex-fixation test, antistreptolysin O titre, and Wassermann reaction were negative. An ECG showed complete heart block.

In 1969 he was admitted to hospital with malaise and fever. A clinical diagnosis of subacute bacterial endocarditis was made and he was treated with an intravenous infusion of one mega unit crystalline penicillin every 4 hours for 28 days; the fever settled within 48 hours but the blood cultures proved sterile.

At review in 1970 he was ambulant and about to return to work, his Reiter's disease having already run a course of 26 years. He had had no pains in the feet for 2 years and no further joint swelling but he had been away from work with pains in the dorsal and lumbar spine. The toes of the left foot were very deformed and spinal movement was much restricted. The clinical signs of aortic incompetence persisted; blood pressure 220/60. An ECG demonstrated persisting heart block with left ventricular hypertrophy. In the left foot there was now radiological evidence of absorption of the head of the second metatarsal bone and early changes in the head of the third metatarsal bone (Fig. 10, overleaf). Further x-rays showed sclerosis of the sacroiliac joints (especially on the right side) and minor plantar spurs without any periosteal reaction on both calcaneal bones. There were many more 'skip' bridging lesions in the dorsal spine (Fig. 11, overleaf) with increasing calcification in the anterior spinal ligament, tomography demonstrating that the bridging lesions did not originate from the end-plate of the

FIG. 7 Case 3. Dorsal spine (1950), showing isolated bony bridge between eleventh and twelfth dorsal vertebrae on left side.

FIG. 8 Case 3. Dorsal spine (1956), showing spread of bony bridging in dorsal spine.

FIG. 9 Case 3. Left foot (1956), showing absorption of head of fifth metatarsal bone with marked periosteal reaction in second and third metatarsophalangeal joints.

FIG. 10 Case 3. Left foot (1970), showing additional absorption of head of second metatarsal and erosion of head of third metatarsal bones.

FIG. 11 Case 3. Dorsal spine (1970), showing further extension of bony bridging lesions

vertebral body. There were no bridging lesions in the lumbar spine where the apophyseal joints were normal and the anterior spinal ligament uncalcified.

Discussion

Csonka and others (1961) found that aortic incom-

petence was an unusual complication of Reiter's disease and it is apparent that it only becomes evident in the long-term follow-up of that small group of patients who have multiple attacks with the development of recurrent anterior uveitis, painful mutilating deformities of the feet, and sacroiliitis. The *post mortem* findings have been reported in two cases (Csonka and others, 1961; Rodnan and others, 1964); in both cases the aortic valve cusps were described as thickened with rolled cord-like edges, atheroma of the aorta being prominent with thinned stretched areas, fibrosis of the adventitia, collagen replacement of the muscle and elastic tissue in the media, and patches of lymphocytic infiltration. Similar autopsy findings have been reported in the aortic lesion of ankylosing spondylitis (Ansell, Bywaters, and Doniach, 1958; Graham and Smythe, 1958; Toone, Pierce, and Hennegar, 1959); the various authors did not consider that their patients had Reiter's disease, but it has been stated that any patient with so-called ankylosing spondylitis who develops cardiomegaly, pericarditis, and conduction defects in the ECG with or without aortic incompetence should be reviewed as a possible case of Reiter's disease (Dixon, 1960). Subacute bacterial endocarditis has never been proven in Reiter's disease, but one probable example has been described by Bontoux, Bastin, and Coste (1967).

The appearance of an atypical spondylitis with the formation of 'skip' bony bridging was first noted in the thoraco-lumbar spine (Weldon and Scalettar, 1961), but subsequent authors have reported similar lesions in both the cervical and dorsal spine (Montgomery and others, 1963; Rodnan and others, 1964; Good, 1965; Peterson and Silbiger, 1967). Montgomery and others (1963) observed that the new bone arose from the lateral aspect of the vertebral body some distance from the end-plate and therefore was unlike an osteophyte. These bony lesions must be distinguished from senile ankylosing hyperostosis of the spine (Forestier and Rotes-Quérol, 1950), the rare familial ankylosing vertebral hyperostosis (Beardwell, 1969), and the progressive paraspinal calcification of psoriasis. In the latter case differentiation is not always clear-cut, since Reiter's disease and psoriasis appear to co-exist in many of the cases described in the literature (Bywaters and Dixon, 1965; Peterson and Silbiger, 1967); moreover, Reiter's disease can give way to the characteristic features of psoriatic arthritis (Khan and Hall, 1965). The particular bony bridging of Reiter's disease has been noted to extend with the ultimate formation of a typical bamboo spine in a series of 47 unusually severe cases and, in twelve subjects (14 per cent.), a firm diagnosis of ankylosing spondylitis was made on follow-up (Good, 1965). The apparent rarity of reports of these spinal bridging lesions may be due to

the fact that a routine radiological survey of the spine is not always undertaken in relapsing Reiter's disease (Murray, Oates, and Young, 1958; Reynolds and Csonka, 1958) and it is suggested that more examples will come to light when this is done.

The other radiological changes in the skeleton do not help in the differentiation of Reiter's disease from ankylosing spondylitis, psoriasis, or rheumatoid arthritis in the particular case. Typical calcaneal spurs with definite erosions and/or florid periosteal proliferation have been regarded as pathognomonic of Reiter's disease (Mason, Murray, Oates, and Young, 1959; Popert, Gill, and Laird, 1964), but similar changes have been described in rheumatoid arthritis (Bywaters, 1954) and psoriasis (Peterson and Silbiger, 1967). Sub-periosteal new bone formation around joints and at tendinous insertions is seen in both psoriasis (Bywaters and Dixon, 1965) and Reiter's disease (Mason and others, 1959; Good, 1965). The sacroiliitis of Reiter's disease is indistinguishable from that of ankylosing spondylitis, although it can be symptomless (Csonka, 1959) or unilateral (King and Mason, 1969), and clinical or radiological extension to the spine has been considered to be rare (Reynolds and Csonka, 1958; Csonka, 1959; Mason and others, 1959; Weldon and Scalettar, 1961). The similarity of the radiological appearances in Reiter's disease, ankylosing spondy-

litis, psoriasis, and rheumatoid arthritis may be explained on the hypothesis that bones and joints can react in only a limited number of ways to any pathological process and therefore that the same appearances may be caused by different aetiological factors; certainly the radiological diagnosis cannot be made without knowledge of the clinical manifestations of the particular case.

Summary

Three cases of longstanding Reiter's disease are reported in which the development of electrocardiographic conduction defects (heart block or bundle-branch block) and aortic incompetence has been observed. The *post mortem* findings in one case are described. In all three cases there was an unusual lateral bony bridging between the vertebral bodies which had a predilection for the dorsal spine and the dorso-lumbar junction, and tended to spare both the lumbar spine and the anterior spinal ligament. Two of the three patients had a febrile illness which was attributed erroneously to subacute bacterial endocarditis.

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