Sacroiliac joint abnormalities in paraplegics*

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SUMMARY We studied 186 paraplegic patients to clarify the pathogenesis of the sacroiliac (SI) joint abnormalities reported in these patients. Partial or complete fusion of SI joints was noted in 47 patients (25%), and milder degrees of abnormalities of these joints were present in 27 patients (15%). The abnormalities differed from those seen in ankylosing spondylitis and were found more commonly in patients with high levels of cord injury. It is likely that trunk mobility is necessary to maintain integrity of SI joints and that absence of such mobility compromises SI joint structure in many paraplegics.

Changes in sacroiliac (SI) joints resembling those seen in ankylosing spondylitis have been reported in 4 to 61% of paraplegics (Abramson and Kamberg, 1949; Abel, 1950; Lodge, 1956; Wright *et al.*, 1965). When first reported this observation was felt to support the idea that sacroiliitis may be aetiologically related to genitourinary infection because of the extremely high incidence of such infections in paraplegics and the high incidence of prostatitis and urethritis in patients with ankylosing spondylitis (Lodge, 1956; Mason *et al.*, 1958; editorial, 1960). However, subsequent studies have shown no correlation between genitourinary infection and SI joint changes in paraplegics (Wright *et al.*, 1965).

Further speculations about the pathogenesis of SI joint abnormalities in paraplegics have dealt with its possible relationship to ankylosing spondylitis and with correlations between the occurrence of such lesions and the level and duration of paraplegia. There are contradictory data about all of these issues (Wright *et al.*, 1965). We performed the present study in order to observe the frequency of SI joint changes in paraplegics and to attempt to answer the following questions: (a) Is it a form of ankylosing spondylitis? (b) Is there any correlation with the level of paraplegia? (c) Is there any correlation with the duration of paraplegia?

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Materials and methods

We studied 186 patients with post-traumatic irreversible paraplegia who were admitted to Highland View Hospital—a rehabilitation centre. The mean age of the patients was 35.5 years (range 16 yr to 73 yr) and mean duration of paraplegia was 5.4 years (range from less than 1 yr to 27 yr). 84% of the patients were males. One of the authors (MAK), without knowledge of the level and the duration of paraplegia, assessed the status of SI joints in anteroposterior views of abdominal radiographs taken prior to intravenous pyelography (Cohen *et al.*, 1967). Abnormalities of the SI joints were classified as follows: (a) severe: bilateral obliteration (ankylosis) of SI joints; either partially or completely; (b) mild: either unilateral partial ankylosis or unilateral or bilateral SI joint narrowing or juxta-articular sclerosis.

Student's *t*-test and the chi-square test were used for significance testing.

Results

Severe SI joint abnormalities were found in 47 paraplegics (25%), while mild changes were seen in 27 (15%). Radiological changes differed from those seen in ankylosing spondylitis in 3 ways. Pseudowidening of the SI joints, which results from severe juxta-articular erosions and is frequently found during the evolution of ankylosing spondylitis was observed in only 1 patient. None of the patients showed the syndesmophytes that are characteristic of ankylosing spondylitis. Finally,

the obliteration of the SI joint in the paraplegics tended to occur primarily at the lower diarthrodial half of the joint.

The frequency and severity of SI joint abnormalities seen at different levels of spinal cord injury are shown in Table 1. Severe abnormalities were noted in 31 of 87 patients with cervical levels of spinal cord injury (36%) and in 16 of 83 patients with thoracic lesions (19%) ($P < 0.02$). No such abnormalities were seen in patients with lumbar levels of paraplegia. The table further shows that SI joint abnormalities, when present, were more severe in patients with lesions at cervical levels, while milder changes were more often seen in patients with lesions at thoracic levels. Patients with lesions at lumbar levels rarely showed SI joint abnormalities.

The effect of duration of paraplegia on the frequency of severe SI joint abnormalities is shown in Figure 1. Among the paraplegics with lesions at

cervical levels the mean duration of paraplegia was found to be 7.90 years ($SD = 3.86$ and $SEM = 0.69$) in the 31 patients with severe SI joint changes and 4.63 years ($SD = 3.76$, $SEM = 0.54$) in the 47 patients with normal joints. This difference is significant ($P < 0.001$). Among the paraplegics with lesions at thoracic levels the mean duration of paraplegia was found to be 7.12 years ($SD = 5.63$, $SEM = 1.40$) in the 16 patients with severe sacroiliac joint changes and 4.44 years ($SD = 4.84$ and $SEM = 0.68$) in the 50 patients with normal joints. This difference did not quite achieve statistical significance ($0.10 > P > 0.05$).

Discussion

Cohen *et al.* (1967) assessed the abnormalities of SI joints visualised during intravenous pyelography in 88 persons without rheumatic disease or paraplegia and found none showing obliteration of these joints. We applied their method of assessment to a paraplegic population and found SI joint ankylosis in 25%, confirming the previously reported high incidence of SI joint abnormality in paraplegics (Wright *et al.*, 1965). Our data indicate that this abnormality usually consists of partial or complete obliteration, most often affecting the lower half (that is, the diarthrodial portion) of these joints.

Table 1 Sacroiliac joint abnormalities in paraplegics related to level of cord injury

Level of cord injury	No. of patients	SI joint abnormality		
		Severe	Mild	None
Cervical	87	31	9	47
Thoracic	83	16	17	50
Lumbar	16	0	1	15
Total	186	47 (25%)	27 (15%)	112 (60%)

Fig. 1 Comparison of duration of paraplegia in patients with severe SI joint changes and in those with normal SI joints. Patients with cervical level of paraplegia are grouped separately from those with thoracic level of paraplegia

Since the evolution of these changes differs from that seen in ankylosing spondylitis, and since syndes-mophytes are lacking, we consider it unlikely that these changes represent a form of ankylosing spondy-litis. These data, however, do not completely exclude the alternative explanation that the changes may be aetiologically related to ankylosing spondylitis and might result from environmental factors, even in the absence of known genetic predisposition. In a recent study of HLA antigens in 44 paraplegics. Hunter *et al.* (1978) found no association between SI joint abnormalities and HLA antigens, including B27.

There is evidence, both during fetal life (Lelkes, 1958; Drachman, 1969), and in adult animals (Ely and Mensor, 1933; Evans *et al.*, 1960; Thaxter *et al.*, 1965) that normal development and maintenance of joint structure are dependent on joint movement. Studies of adult animal joints immobilised for periods of up to 90 days have shown proliferation of fibrous tissue and degeneration of cartilage (Ely and Mensor, 1933; Evans *et al.*, 1960; Thaxter *et al.*, 1965). It is not unlikely that such change would progress to fibrosis and eventual bony ankylosis in a narrow diarthrosis like the SI joint if immobilisation were continued over a period of years. A recent abstract (Polmoski and Brandt, 1978) has revived interest in the effect of immobility on joint structure.

In this study the occurrence of severe SI joint changes was related to high spinal levels of para-plegia. In patients with cervical levels of paraplegia these SI joint changes were also related to duration of paraplegia. The most likely explanation for these findings in our opinion is that the degree of trunk mobility necessary to maintain integrity of SI joints is lacking in these patients. With high levels of cord damage severe limitation of trunk mobility is more likely. Partial or complete fusion of SI joints might be expected more frequently under these circum-stances with the passage of time.

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