# Role of computed tomography in the evaluation of suspected sacroiliac joint disease

**H E Fewins** FRCF[1] **G H Whitehouse** FRCR[1] **R C Bucknall** FRCP[2] [1]*University Department of Radiodiagnosis and* [2]*Department of Medicine, Royal Liverpool Hospital, Liverpool L69 3BX*

*Keywords:* computed tomography; sacroiliac joints; sacroiliitis

## Summary

Computed tomography (CT) was compared with plain radiography in 41 examinations of selected patients with a clinical history suggestive of sacroiliac joint disease.

The obliquity of the sacroiliac joints renders radiographic interpretation difficult. In the 41 cases who were examined with standard anteroposterior and posteroanterior radiographs of the sacroiliac joints, four were normal, eight abnormal and 29 were equivocal. Equivocal findings included indistinct and possibly irregular articular margins to the joints and subarticular sclerosis. Of the 29 equivocal studies, nine were normal on CT and 20 were abnormal.

CT demonstrated definite changes of sacroiliac joint disease in 29 of the 41 examinations, 16 of which were sacroiliitis and 13 osteoarthritis. With plain radiography four of the eight abnormal studies were consistent with sacroiliitis, and four with osteoarthritis. It is concluded that CT is more sensitive than plain radiography in the evaluation of sacroiliac joint disease, and is especially valuable when there are equivocal plain radiographs.

## Introduction

The obliquity and complex shape of the sacroiliac joints renders radiographic interpretation difficult. A confident diagnosis of sacroiliac joint disease in the patient with suggestive symptoms cannot always be confirmed by plain radiographs alone[1,2]. Linear tomography can provide more information about joint space narrowing and ankylosis than plain radiographs[3], but erosive changes, sclerosis and osteophytes are demonstrated with approximately the same frequency by plain radiography. Firooznia *et al.*[4] have suggested that complex motion tomography may be highly sensitive for the detection of early joint erosive changes in sacroiliitis, but it does carry a high radiation dose. Quantitative sacroiliac scintigraphy is a sensitive method of detecting sacroiliitis, but its diagnostic usefulness is limited by poor specificity[1,2,5].

Carerra *et al.*[6] and Taggart *et al.*[7] suggested that CT is more sensitive than plain radiography in establishing an early diagnosis of inflammatory sacroiliac joint disease. Computed tomography, by providing a series of axial sections through the joints, reduces the problems of interpretation caused by overlying soft tissues and by the oblique orientation of the joints. At present magnetic resonance imaging, with its lack of ability to demonstrate cortical erosions, seems unlikely to prove superior to CT in sacroiliac joint imaging[8].

The aim of the present study was to evaluate the role of CT in a selected group of patients whose symptoms were consistent with sacroiliac disease but in whom plain radiography was either equivocal or normal.

## Patients and methods

Forty patients attending a rheumatology outpatient clinic over a period of one year were selected for CT examination. There were 14 men and 26 women in the group with a mean age of 37 years (the range was 16-73 years). The criteria for clinical diagnosis of sacroiliitis included the symptom of lumbar backache associated with early morning stiffness, and the physical signs of local tenderness and/or pain on stressing the sacroiliac joints[9]. Psoriasis was present in five cases and Reiter's syndrome in four cases, while one patient had Crohn's disease. These patients were regarded as 'difficult cases' by a rheumatology unit with wide experience and importance was

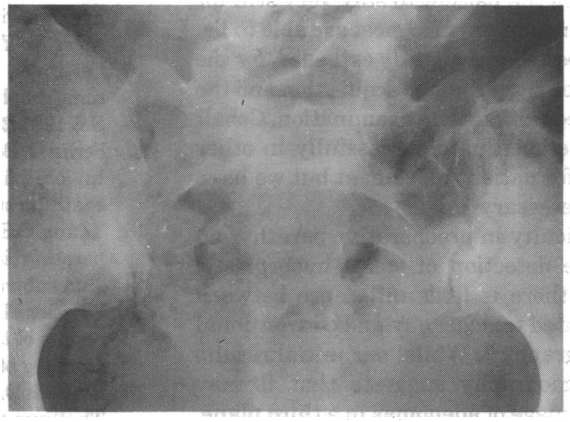

*Figure 1. Bilateral periarticular sclerosis and indistinct joint margins, more marked on the right, consistent with sacroiliitis*

*Figure 2. Limited iliac sclerosis (arrow) and indistinctness of the joint margin on the right side of a patient with Reiter's syndrome*

0141-0768/90/070430-03/$02.00/0

attached to obtaining a diagnosis in order that advice concerning treatment, beneficial alterations in lifestyle and prognosis, could be given to the patient. Tissue typing to identify HLA antigens was not performed as it is considered to have limited diagnostic value[9] and is expensive. Anteroposterior (AP) and coned posteroanterior (PA) radiographs of the sacroiliac joints were obtained, the latter with a 20° caudal tube angulation. Several patients also had oblique views. The CT examinations were performed using a General Electric 9800 scanner. Up to 12 contiguous sections, 5 mm in thickness, through the synovial portion of the joints were obtained on a bone algorithm. Both plain radiographs and CT scans were assessed by two experienced observers independently and in those cases where opinion varied, agreement was reached through discussion. Plain radiographs were classified as normal, equivocal, consistent with osteoarthritis or as demonstrating definite changes of sacroiliitis (Figure 1). Equivocal findings consisted of questionably indistinct joint margins as well as non-specific subarticular sclerosis (Figure 2).

## Results

In a total of 41 plain radiographic examinations, four were normal, four showed osteoarthritis and in four cases there were changes of sacroiliitis. Twenty-nine plain radiographic examinations were considered to be equivocal. In the four cases where plain radiographs were deemed to be normal, CT scanning showed normal appearances in three, limited but definite joint erosive change being seen on one sacroiliac joint in the other case. In this particular instance, the subsequent demonstration of increased radionuclide uptake at this site further supported the diagnosis of an early sacroiliitis. Nine of the twenty-nine equivocal studies were considered normal on CT, nine showed changes of osteoarthritis and 11 were consistent with active sacroiliitis. CT confirmed all the abnormal plain radiographic findings and gave additional information about the extent of disease in the four cases classified as osteoarthrosis and the four as sacroiliitis.

## Discussion

Vogler *et al.*[10] performing CT scans on the sacroiliac joints of 45 asymptomatic subjects, concluded that the CT appearance of normal sacroiliac joints varies with age and described guidelines for the diagnosis of sacroiliitis in the age groups under and over 30 years of age.

*Figure 3. Non specific iliac sclerosis affecting the right sacroiliac joint*

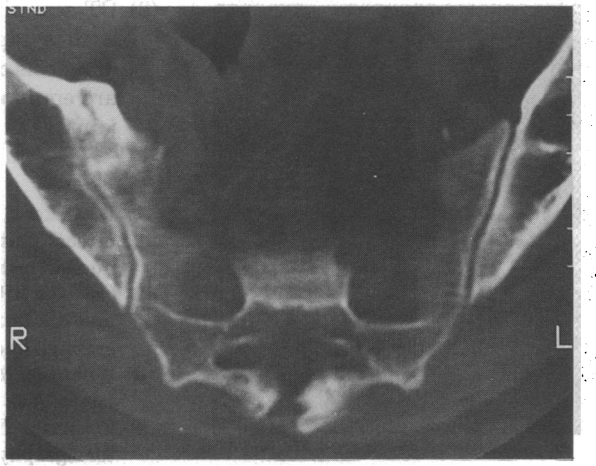


*Figure 4. CT examination of the same patient as Figure 3 confirming exuberant anterior bridging osteophyte formation on the right, consistent with osteoarthritis*

With increasing age, even in asymptomatic subjects, the changes associated with osteoarthritis are seen; namely focal joint space narrowing, anterior bridging osteophytes, and ligamentous ossification. Iliac and sacral subchondral sclerosis is seen in asymptomatic subjects of all ages but is more common and extensive in the older age group. Iliac sclerosis alone is therefore not a reliable indicator of sacroiliitis (Figures 3 and 4). However, isolated sacral sclerosis extending from the joint margin into the sacral ala for a distance of 3 mm or more is considered by Vogler *et al.*[10] to be uncommon under 40 years of age and has been postulated as an early CT indicator of inflammatory joint disease in the younger patient.

On CT imaging the width of the normal sacroiliac joint space in a young adult patient lies between 2 and 4 mm[7]. The definitive CT signs of sacroiliitis therefore include articular erosions, intra-articular bony ankylosis and a uniform joint space of less than 2 mm in width. These findings are illustrated in Figures 5 and 6. In the under-30 years age group, overall asymmetry of the joints, and isolated sacral subchondral sclerosis may also be significant indicators of inflammatory disease.

In the present study, CT demonstrated definite changes of sacroiliac joint disease in 29 of the 41 examinations, the appearances being those of sacroiliitis in 16 and osteoarthritis in 13 cases. These findings thus confirm that CT is more sensitive than

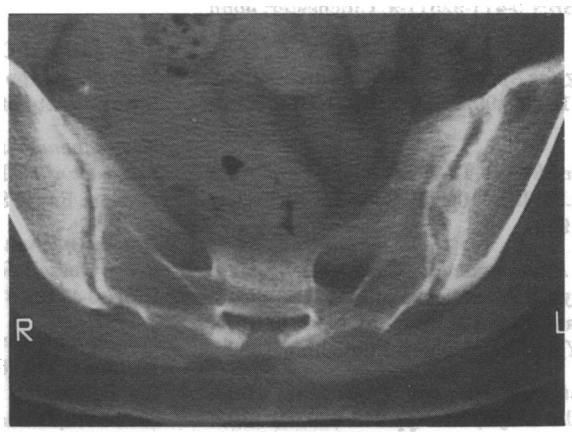


*Figure 5. CT scan shows bilateral erosive changes and intra-articular bony bridging, confirming sacroiliitis. The changes on the left appear more extensive than anticipated from the plain radiograph (patient as in Figure 1)*

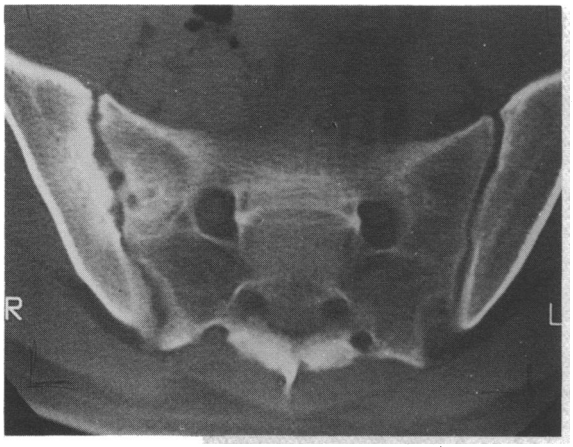


*Figure 6. CT scan demonstrates extensive erosive sacroiliitis on the right side. The left sacroiliac joint is normal (patient as in Figure 2)*

plain radiography in detecting sacroiliac joint disease. The cost of CT examination is approximately four times that of plain radiography. As performed in this study, the radiation dose from CT was of the order of four times that of the conventional examination. However, with CT it was possible to make a definitive diagnosis in every case and thus provide advice at a relatively early stage regarding exercise, drug therapy and prognosis.

When faced with the 'difficult case' of suspected sacroiliac joint disease the following guidelines may be helpful:

(1) CT scanning of the sacroiliac joints is unnecessary in patients with definite plain radiographic abnormalities and in the first instance when the plain films are regarded as being normal.

(2) CT scanning is especially valuable for patients with symptoms and signs consistent with the diagnosis of sacroiliac disease, but in whom there are equivocal plain radiographs of the sacroiliac joints.

**References**

1 Dequeker J, Goddeeris T, Walravens M, *et al.* Evaluation of sacroiliitis: comparison of radiological and radionuclide techniques. *Radiology* 1978;**128**:687-89
2 Goldberg RP, Genant HK, Shimshak R, *et al.* Applications and limitations of quantitative sacroiliac joint scintigraphy. *Radiology* 1978;**128**:683-6
3 Wilkinson M, Meikle JAK. Tomography of the sacroiliac joints. *Ann Rheum Dis* 1966;**25**:433
4 Firooznia H, Golimbu C, Rafii M, *et al.* Computed tomography of the sacroiliac joints: comparison with complex motion tomography. *CT: J Comput Tomogr* 1966;**8**:31-9
5 Fam AG, Rubenstein JD, Chin-Sang H, *et al.* Computed tomography in the diagnosis of early ankylosing spondylitis. *Arthritis Rheum* 1985;**28**:8
6 Carerra GF, Foley WD, Kozin F, *et al.* CT of sacroiliitis. *AJR* 1981;**136**:41-6
7 Taggart AJ, Desai SM, Iveson JM, *et al.* Computerised tomography of the sacro-iliac joints in the diagnosis of sacroiliitis. *Br J Rheumatol* 1984;**23**:258-66
8 Lawrence Burk D, Dalinka MK, Shiebler ML, *et al.* *Radiologic Clinics of North America* 1988;**26**:No. 3
9 Brewerton DA. Ankylosing spondylitis, psoriasis, Reiter's disease and related conditions. In: *Mason and Currey's clinical rheumatology*, 4th edn. Edinburgh: Churchill Livingstone, 1986:89-90
10 Vogler JB, Brown WH, Helms CA, *et al.* The normal sacroiliac joint: A CT study of asymptomatic patients. *Radiology* 1984;**151**:433-7

*(Accepted 17 November 1989)*

## Some recent books

**Environment/Health Care**

*Adequacy of Sample Size in Health Studies.* Stanley Lemeshow, David W Hosmer Jr, Janelle Klar and Stephen K Lwanga. (pp 239) ISBN 0-471-92517-9, Chichester: John Wiley & Sons 1990

*An Outline of Sociology as Applied to Medicine 3rd Edition.* David Armstrong. (pp 139, £8.95) ISBN 0-7236-1691-4, Kent: Wright 1989

*Changing Ideas in Health Care.* David Seedhouse and Alan Cribb, eds. (pp 236 £9.95) ISBN 0 4719-2068-1, Chichester: John Wiley & Sons 1989

*Clinical Effects of Environmental Chemicals.* Renate D Kimbrough, Kathryn R Mahaffey, Philippe Grandjean, Sten-Henrik Sandoe and David D Rutstein. (pp 110) ISBN 0-89116-921-0, New York: Hemisphere Publishing 1989

*Educating Competent and Humane Physicians.* Hugh C Hendrie and Camille Lloyd, eds. (pp 242 $29.95) ISBN 0-253-32725-3, Indiana: Indiana University Press 1990

*Ethics in Health Education.* Spyros Doxiadis, ed. (pp 215 £34.95) ISBN 0-47192-606-X, Chichester: John Wiley & Sons 1990

*Facts for Life. A Communication Challenge.* Peter Adamson with the assistance of Glen Williams (pp 78 $1.00) Available from: UNICEF, DIPA, Facts for Life Unit, 3 UN Plaza, New York, NY 10017, USA (in Arabic, English, French, Portuguese and Spanish)

*How to Search the Medical Sources.* Brian Livesey and Barry Strickland-Hodge (pp 119) ISBN 0-566-03533-2, Hampshire: Gower Publishing 1989

*Major Chemical Disasters - Medical Aspects of Management.* (International Congress and Symposium Series). Virginia Murray, ed. (pp 204 £15.00) ISBN 1-85815-104-1, London: Royal Society of Medicine Services 1990

*New Advances in the Control of Lipid Metabolism: Focus on Pravastatin.* J C LaRosa, ed. (pp 43 £5.00) ISBN 1-85315-121-1, London: Royal Society of Medicine Services 1989

*Ozone Depletion. Health and Environmental Consequences.* Robin Russell Jones and Tom Wigley, eds. (pp 280 £35.00) ISBN 0-47192-316-8, Chichester: John Wiley & Sons 1989

*Postgraduate Medical Journal. Festschrift for Sir David Innes Williams Vol. 66 Supplment 1.* Published on behalf of the Fellowship of Postgraduate Medicine. (pp 75) ISBN 0032-5473, London: Scientific & Medical Division, Macmillan Press 1990

*The Politics of Public Health.* Meredeth Turshen. (pp 319 £32.95 hb £9.95 pb) ISBN 0-86232-894-2 (hb) ISBN 0-86232-895-0 (pb), London: Zed Books 1989