DISCUSSION

FDG is a tracer of cellular energy metabolism, and increased FDG uptake is not limited to malignant tissue. FDG is taken up not only by viable tumor cells, but also by peritumoral granulation tissue, activated macrophages within the tumor and cells at the periphery of necrotic tumoral tissue (*12*). Tissue inflammation may manifest increased glycolysis, but the increase in metabolic rate due to inflammatory changes is usually substantially less than that of neoplastic tissue. Inflammation and malignancy generally are differentiated on the basis of SUV (*1–3*), which allows a numerical comparison of areas of abnormally increased FDG uptake with areas of normal tissue. An SUV threshold of 2.5 has been empirically determined to provide both good sensitivity and specificity in differentiating benign from malignant lesions in evaluating patients with solitary lung nodules (*1–3*).

Mild elevations in FDG uptake, with SUVs less than 2.5, have been reported in bacterial pneumonia (*1,7*). However, in this case, the right lung pneumonia demonstrated a markedly elevated SUV of approximately 5, similar to the patient's concurrent malignancy in the contralateral lung.

In the thorax, several benign diseases have been reported to be associated with increased FDG accumulation. False-positive findings, defined by an SUV of greater than 2.5, have been reported in inflammatory and granulomatous processes such as aspergillosis, cryptococcosis, histoplasmosis, tuberculosis, Wegener's granulomatosis, histiocytosis, sarcoidosis and several benign tumors such as neurofibroma, inflammatory pseudotumor, schwannoma and fibrous mesothelioma (*13,5*).

In our case, bacterial pneumonia was presumed the cause of the increased FDG accumulation in the right upper lobe. Although cultures failed to isolate the organism, the infiltrate resolved with standard antibiotic therapy. It has been shown in a rabbit model that neutrophil activity may be responsible for the increased FDG uptake in pneumonia (*14*). Intense inflammatory response in pneumococcal pneumonia resulted in airspace accumulation of neutrophils with persistence of associated elevated FDG uptake for up to 3 wk (*14*).

The increased use of PET to diagnose and stage thoracic malignancy may result in cases in which increased FDG uptake due to pyogenic pulmonary infections may be misinterpreted as malignancy. Such infections may result in SUVs well within the range for malignancy, as demonstrated in this case.

CONCLUSION

The overlap between FDG uptake of malignant lesions and some severe infectious processes such as pneumonia may limit the use of PET as a diagnostic tool in evaluating solitary pulmonary lesions. Caution should be exercised when interpreting FDG PET images in patients with focal abnormalities on chest radiographs.

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Influence of Age and Gender on Quantitative Sacroiliac Joint Scintigraphy

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The value of quantitative sacroiliac joint scintigraphy for detecting sacroiliitis is controversial. Age and gender may contribute to this discordance. In previous reports, the number of control groups has been small and might not exactly reflect the change of sacroiliac/sacral (SI/S) ratios related to different age. In addition, the selection of control subjects was not strict. In most studies, care was not taken to ensure that control subjects did not have a history of back pain or any other relevant conditions. In addition, there was no requirement for a normal radiograph as a condition of inclusion. The aim of our study was to evaluate the consequent changes in SI/S ratios, according to age (in 10-yr intervals) and gender. **Methods:** Over a period of 5 yr, 413 control subjects without a history of back pain, scoliosis, kyphosis, joint pain, arthritis, lesions within the pelvis, chemotherapy or systemic disease such as diabetes or systemic lupus erythematosus were included in this study. A posterior planar film of the pelvis was obtained to calculate SI/S ratio 3 hr after injection of 740 MBq ^{99m}Tc-methylenediphosphonate. Our data showed that: (a) the change in SI/S ratios related to age was significant in both females and males; (b) the SI/S ratios were higher in males younger than 30 yr and higher in men in the 41–50-yr age group and in females in other groups; (c) the SI/S ratios declined steadily with increasing age in females, whereas there were two plateaus in men aged 21–40 yr and 41–70 yr; (d) there were significant differences of SI/S ratios between the genders in certain age groups; and (e) no differences were found between left SI/S ratios and right SI/S ratios. **Conclusion:** The influence of age and gender on SI/S ratios are substantial, and it is essential for each department to establish its own values for SI/S ratios based on gender and age (in 10-yr intervals).

Key Words: sacroiliitis; sacroiliac joint scintigraphy; age; gender

J Nucl Med 1998; 39:1269–1272

Received Jul. 11, 1997; revision accepted Oct. 13, 1997.

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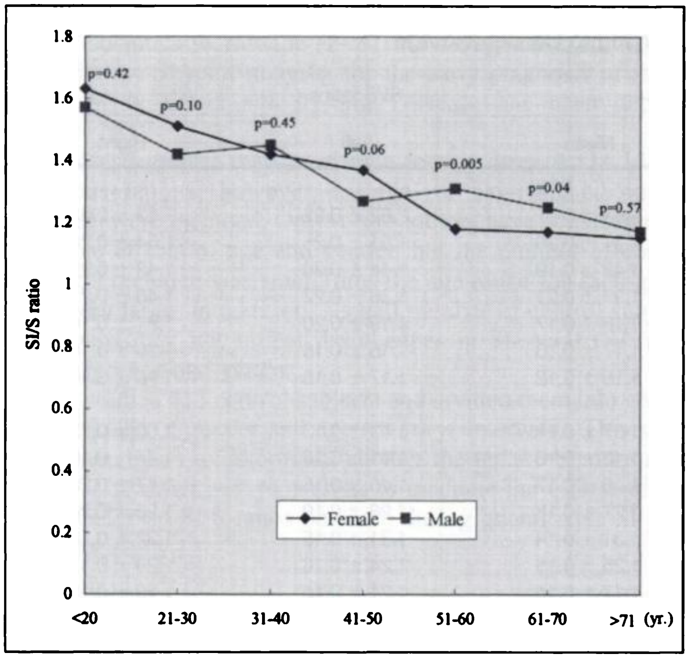

FIGURE 2. SI/S ratios and statistical results of females and males in different age groups.

males was significantly higher than the right SI/S ratio in 43 females. In the study by Pitkanen et al. (*16*), no significant difference could be found between the SI/S ratios for females and males. In this study, we found that the decrease in SI/S ratios was steady in females aged 50 and younger and became pronounced in women in the 50–60-yr group, which is the time of menopause. Before age 50, the SI/S ratios in females were higher than the SI/S ratios in males, except for men in the 31–40-yr age group. However, the ratio in males was higher than in women older than 50 yr because of the big drop in SI/S ratios in women aged 50–60 yr. The dramatic change was believed to result from the hormonal changes after menopause in women.

We also found that the SI/S ratio values were significantly different between women and men in the age groups of 41–50 yr, 51–60 yr and 61–70 yr. The SI/S ratios were significantly affected by gender, and they were not always high because they changed with age. Establishing normal values of SI/S ratios for different genders and different ages is important.

Verlooy et al. (*7*) reported that the left mean SI/S ratio was significantly higher than the right mean SI/S ratio. Pitkanen et al. (*16*) found that the differences between the SI/S ratios of right and left SI joints were not statistically significant. Our data suggest that there is good symmetry between left and right SI/S ratios.

In addition to age and gender, many factors have been reported to influence SI/S ratios. These factors include position of patients during imaging, selection of the ROI, the volume of the sacral segments and the time of imaging after the administration of the radiopharmaceutical (*11,12,17,18*). Dodig et al. (*17*) reported that SI/S ratios increased in a group of normal subjects 150 min after the administration of the radiopharmaceutical, and, in a group of patients with sacroiliitis, the ratios increased after 210 min. To consider the clinical convenience and to obtain an accurate SI/S ratio, we performed imaging studies 3 hr after injection of ^{99m}Tc-MDP. In some studies (*12,17,18*), imaging was performed 2 hr postinjection, which was probably not the optimal time interval to obtain reliable SI/S ratio values. In this study, we divided the SI joint into three sections: superior, middle and inferior because, in the SI joint, only the lower half of the joint space is lined by synovium. Therefore, not all of the radioactivity found in the SI joints, from ^{99m}Tc-MDP, is due to uptake solely by the synovial membrane. However, an SI/S ratio for the entire SI joint may decrease the sensitivity for detecting synovitis in patients. Our methods were similar to the methods of Prakash et al. (*14*).

CONCLUSION

We conclude that: (a) SI/S ratios decreased significantly as age increased in both females and males; (b) the SI/S ratios were higher in males younger than 30 yr and in men in the 41–50-yr age group and in females in other groups; (c) the SI/S ratios decreased steadily with increasing age in females, whereas there were two plateaus in men aged 21–40 yr and 41–70 yr; (d) there were significant differences in SI/S ratios between different genders in certain age groups; and (e) no differences were found between left SI/S ratios and right SI/S ratios. We believe that some of the controversies surrounding the clinical application of SI/S ratios for detecting acute sacroiliitis are probably related to the inadequate attention given to establishing normal values. Finally, it should be mentioned that our ratios are valid only for our method and we consider it essential for each department to establish its own values for SI/S ratios on the basis of gender and age (in 10-yr intervals) for the clinical application of quantitative SI joint imaging.

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