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TC-99M MDP AND TC-99M HMPAO LABELLED LEUKOCYTE SCANS IN TUBERCULOUS SPONDYLITIS

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Abstract

A study was undertaken to assess the pattern of uptake on bone and labelled leukocyte scans in tuberculous spondylitis. Nine consecutive newly diagnosed cases were studied with Tc-99m MDP bone scans and Tc-99m HMPAO labelled leukocyte scans. The patients had basic laboratory investigations, plain chest and spine radiographs and computed tomography of the spine. Static images of bone scans were acquired at 3 hours and labelled leukocyte scans were acquired at 1, 3 and 24 hours post-injection. A total of 11 spinal lesions were detected. Six bone scans were done demonstrating eight lesions and all showed abnormally increased activity. Labelled leukocyte scans were done in eight patients involving ten lesions and all except one showed photopaenic defects at the regions of interest. Both bone scan and leukocyte scan provided important information about the extent of the lesions and the combination of their pattern of uptake helped in the diagnosis of tuberculous spondylitis.

Full text

Infective spondylitis remains a major clinical problem. Two major aetiological causes are tuberculous and pyogenic. Other causes such as fungal are rare. Chemotherapy and surgery have specific roles and implications in the treatment of both types of infection (1-6). However, due to the great diversity and non-specificity of the signs and symptoms, it is often difficult to make a diagnosis of spondylitis and to differentiate between the different causes. Malawski et al (2) reported that 66.3% of confirmed pyogenic spondylitis patients are initially diagnosed as tuberculous spondylitis. Weaver et al (7) found that when they encountered 123 cases of spinal tuberculosis, there were 100 other patients referred with the presumptive diagnosis of tuberculous spondylitis proven to have other disease entities.

Many studies have been performed in an attempt to establish specific pattern of radiological changes for tuberculous and pyogenic spondylitis (8-12). Allen et al (13) studied 45 proven spinal infections and concluded that there is no radiological pattern completely reliable in distinguishing tuberculous from non-tuberculous infection. The role of leukocyte labelled scans is well established in cases of pyogenic osteomyelitis (14). Focal increase of tracer at the region of interest is seen due to localised accumulation of white cells. Its role in the tuberculous form of osteomyelitis is not yet evaluated. We report our findings on 9 cases of tuberculous spondylitis.

Materials and Methods

Nine consecutive newly diagnosed adult cases of tuberculous spondylitis were included in the study. Each patient was given a thorough explanation and full blood count, ESR and Mantoux tests were performed. A set of plain chest and spine radiographs were done followed by plain computed tomography at the region of interest.

Bone scintigraphy were performed after injection of 740 MBq Technetium-99m methylene diphosphonate (MDP). Static images were acquired at 3 hours post-injection. Technetium-99m Hexamethylpropylamine oxime (HMPAO) labelled leukocytes scans were performed using the MRC Cyclotron Unit/Hammersmith protocol (15). Mixed autologous leukocytes labelled with 500 MBq Tc-99m were injected intravenously and images were taken at 1, 3 and 24 hours post-injection. Imaging were performed on a large field of view gamma camera with low-energy high-resolution parallel-hole collimator using a 20% window centred over the 140 keV photopeak of Tc-99m. Both anterior and posterior views of the spine were acquired for five hundred thousand counts each. Both studies were performed within five days of each other regardless of which study was done first.

Radiotracer uptake on both bone and leukocyte images was compared to adjacent and presumably normal, vertebral activity and classified as normal (equal to), increased or decreased. Fine needle aspiration biopsy were performed in two cases and surgical debridement in one. The study was approved by the local ethical committee.

Final diagnoses were based on combination of laboratory studies including microbiologic and histologic data, radiographic findings and clinical course. Tuberculous therapy was given to all patients and all were discharged well.

Results

Five patients were male and four were female. Their ages range from 33 to 85 with an average age of 60. Five presented with symptom of back ache and the other four with lower limb weakness. The duration of symptoms range from 2 weeks to 1 year. Neurology was intact in all the 5 patients who presented with backache and was abnormal in the other 4 with lower limb weakness.

Average mantoux test was 14 mm. Average total white cell count was 9,912 with 65% granulocytes and 27% lymphocytes. Average ESR was 77 mm/hr.

Plain radiographs of the spine showed symmetrical destructive lesions involving the adjacent surfaces of two vertebrae with variable degree of reduction in height of the disc spaces (Fig. 1). A total of 11 lesions were seen. There was one lesion involving the cervical spine, four involving the thoracic and six involving the lumbar spine.

Computed tomography was done in 8 patients involving 10 lesions. Six of the ten lesions showed features of bony fragmentation whilst the other four showed features of bony destruction (Fig. 2). Paravertebral abscesses were seen in 5 patients.

Six bone scans were done demonstrating eight lesions. All showed abnormally increase activity at the site of the spinal lesions (Fig. 3). Labelled leukocyte scans were done in eight patients involving ten lesions. Average labelling efficiency was 38%. Nine

lesions appeared as photopaenic defects at the same sites of abnormality as the bone scans (Fig. 4). In another patient, the scan appeared normal. The images taken at 1 and 3 hours were the most helpful.

Discussion

Tuberculous spondylitis is a chronic infective process that results primarily from haematogenous spread (16). It may also result from direct extension of involved lymph nodes (17).

The most frequent sites of involvement are the lower thoracic and the lumbar spine (1). It usually begins at the anterior third of the vertebral body (10) and soon spread up and down the vertebral column beneath the anterior longitudinal ligaments. Paravertebral abscess is seen on plain radiographs in 58% of patients (7). Computed tomography demonstrates evidence of bony destruction at the anterior vertebral bodies with paraspinal abscesses (10).

In tuberculous spondylitis, polymorph infiltration occurs as an initial acute inflammatory event. These cells are rapidly destroyed by the tubercle bacilli. By the time the patient presented for medical attention and biopsy done, histological specimen would show a granulomatous reaction with or without caseation necrosis (18). Evidence of osteoblastic and osteoclastic activities would invariably be present as a result of destructive and repair processes affecting the vertebral bodies. Presumably, this is the basis for the lesion to take up the tracer on a bone scan whilst it appears cold on a leukocyte scan.

All our bone scans showed high uptake corresponding to the spinal lesions. However, other studies such as by Weaver (7) showed a more variable pattern. Only 64%

showed increased activity whilst 35% are normal and 1 patient had a negative cold scan. It was postulated that at an early stage, a purely lytic process together with avascularisation due to the presence of surrounding pus would be responsible for the large number of negative bone scans.

In a report by Palestro (19) who studied 28 cases of infective spondylitis, a variable pattern of uptake on the leukocyte scans were noted in cases with pyogenic aetiology. However, in the two cases due to M. tuberculosis, both scans showed focal areas of photopenia. This is consistent with our own finding.

Conclusion

Bone scan and labelled leukocyte scan were useful in assessing the extent of tuberculous spondylitis and their combination of uptake pattern could be a valuable diagnostic tool in its diagnosis.

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Legends for illustrations

Fig. 1 Lateral radiograph showing symmetrical destructive lesions involving the adjacent surfaces of T6 and T7 vertebrae with reduction in height of the disc spaces.

Fig. 2 Transverse CT scan at the same level showing bony destruction and paraspinal soft tissue mass.

Fig. 3 MDP bone scan showed a focal area of high uptake at the level of T6 vertebrae.

Fig. 4 A labelled leukocyte scan showed a cold defect at the corresponding site.

ABSTRAK

Satu kajian telah dijalankan mengenai skan tulang dan skan sel darah putih dalam tuberculous spondylitis. Sembilan kes dikenalpasti dan kajian Tc - 99m MDP skan tulang dan Tc - 99m HMPAO skan sel darah putih telah dijalankan. Kajian asas makmal, X-ray dada dan spina dan skan CT spina juga dijalankan. Gambar statik skan tulang diambil 3 jam selepas injeksi dan gambar skan sel darah putih pada 1, 3 dan 24 jam selepas injeksi. Sejumlah 11 lesi spina di kesan. Enam skan tulang melibatkan 8 lesi menunjukkan aktiviti tinggi yang tidak normal. Skan sel darah putih pula dilakukan ke atas 8 pesakit melibatkan sepuluh lesi. Semua, kecuali, satu menunjukkan tiada aktiviti ditempat yang dikaji. Kedua-dua skan memberi maklumat penting mengenai bahagian yang terlibat dan kombinasi aktiviti membantu dalam diagnosis penyakit tuberculous spondylitis.