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HAEMOPHILIC ARTHROPATHY SURVEYED WITH WHOLE-BODY GAMMA-CAMERA SCINTIGRAPHY

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A number of joints suffering from haemophilic arthropathy was studied. They were surveyed clinically, radiologically, and with a new system of whole-body gamma-camera scintigraphy. This radio-isotopic technique provides advantages such as sensitivity, speed and safety. The results of the survey are presented and discussed.

Key words: haemophilia; arthropathy; whole-body gamma-camera scintigraphy

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Haemophilic arthropathies create a variety of problems to the clinicians as far as their diagnosis, evolution and treatment are concerned. The radiological methods used for the study of these arthropathies have their well-known limitations while, on the other hand, the sensitivity of radio-isotopic techniques used for the early detection of bone lesions has been well documented. Generalised articular lesions, such as those observed in haemophilia have not been systematically investigated with scintigraphy.

The articular lesions of haemophilic patients seen at "Vassilefs Pavlos" Hospital were examined with 99 m Technetium Pyrophosphate and a new system of whole-body scintigraphy was developed which combines the scintillation camera and a table which can be moved automatically. The results of this examination were compared with clinical and radiological data.

PATIENTS AND METHODS

Forty patients aged from 5 to 49 years were examined during the past two years. Thirty-two of these patients suffered from haemophilia A (27 with a severe and 5 with a mild form) and eight suffered from haemophilia B (a severe form) (Table 1). All patients had histories of repeated haemarthroses (three or more) occurring in various joints. On clinical examination there was no evidence of acute haemarthrosis.

A comparative study based on clinical radiological and scintigraphic data was performed on the following joints: shoulders, elbows, hips, knees, and ankles (Table 2). The clinical data for this study consisted of a recording of the range of movement of all joints examined. The recorded figures represent the percentage of the full range of movement of these joints, which is rated 100 per cent.

The radiological data included X-rays of the joints studied, which were divided into 4 groups according to the severity of articular lesions. These lesions included: 1) Narrowing of the joint space; 2) Sclerosis; 3) Cyst formation; 4) Osteoporosis; and 5) Destruction of Bone Architecture.

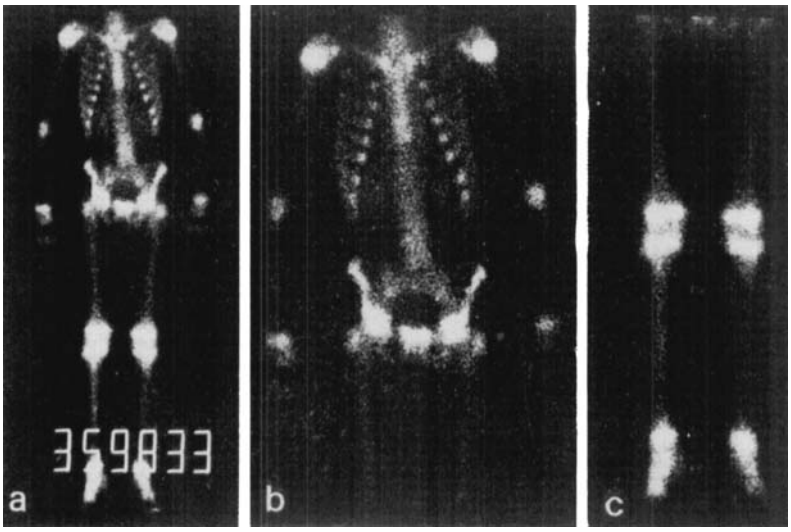

Figure 1. Scintigram of normal young subject. a. = Whole-body scanning (A–P view). b. = Enlargement of the upper half of the body. c. = Enlargement of the lower half of the body.

Table 1. Haemophilic arthropathy surveyed with whole-body gamma-camera scintigraphy.

Type	No.	Severe	Medium
A	32	27	5
B	8	8	–
Total	40	35	5

Table 2. Haemophilic arthropathy surveyed with whole-body gamma-camera scintigraphy.

Joints studied	(400)
Shoulders	80
Elbows	80
Hips	80
Knees	80
Ankles	80

The scintigraphic study of the skeleton was performed with a gamma-camera (Dyna-camera 3c Picker) combined with a system which allowed recording of whole-body scintigrams for approximately 10 minutes (Omniview whole-body imaging system). This system includes an automatic mobile table and an electronic control panel. The gamma-camera detector, which is stable, surveys an area of 200 × 60 cm². The control panel checks various parameters such as the dimensions of the area, the dimensions of the picture, the speed of movement of the table, etc. The pictures are recorded on a Polaroid film as well as on a video-tape. Play-back enlargements of the areas of interest can also be produced. The study of the skeleton starts three hours after intravenous administration of 5 to 10 mCi (according to age) of 99 m Technetium Pyrophosphate (Cooke & Kaplan 1972).

The patient is placed in the supine position on the table with the detector above him. In this position the detector lies very close to most of the joints, especially the knees and ankles, which are both of great interest. Figure 1 shows the whole of the skeleton and of the limited areas of interest of a normal subject.

In children, the growth zones present a high fixation of the tracer. In the lower limbs the epiphyses look like horizontal bands. The hips and shoulders present a round area of high activity. In order to evaluate the images, each skeletal segment is compared with its contralateral segment and the surrounding area.

The absorbed dose of radioactivity for a whole-body scanning is 0.05 rad per mCi while for the 15 radiographs required for the survey of the joints studied the dose is 0.52 rads.

RESULTS

Haemophilic arthropathies examined with radio-isotopic techniques present a high fixation of the tracer (Figures 2 and 3).

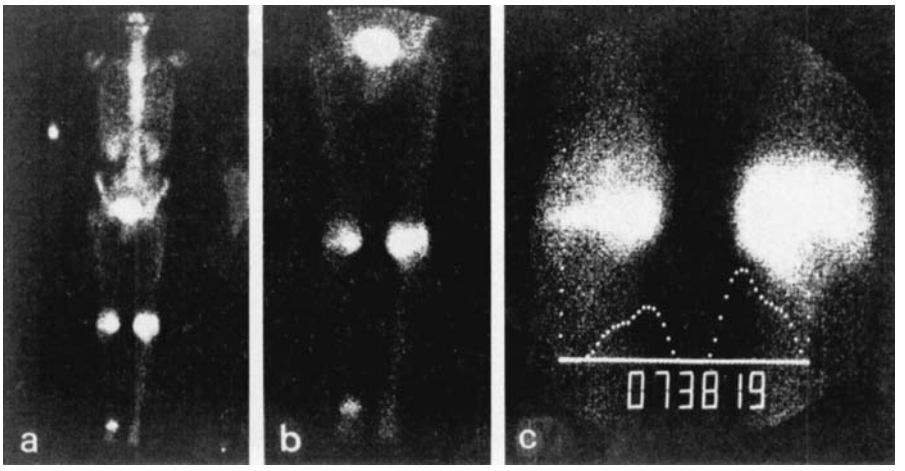

Figure 2. Scintigram of haemophilic patient. a. = Whole-body scanning (A–P view). A high uptake is noted in the right elbow, both knees, and right ankle. b. = Enlargement of the lower half of the body. c. = Enlargement of the knee area.

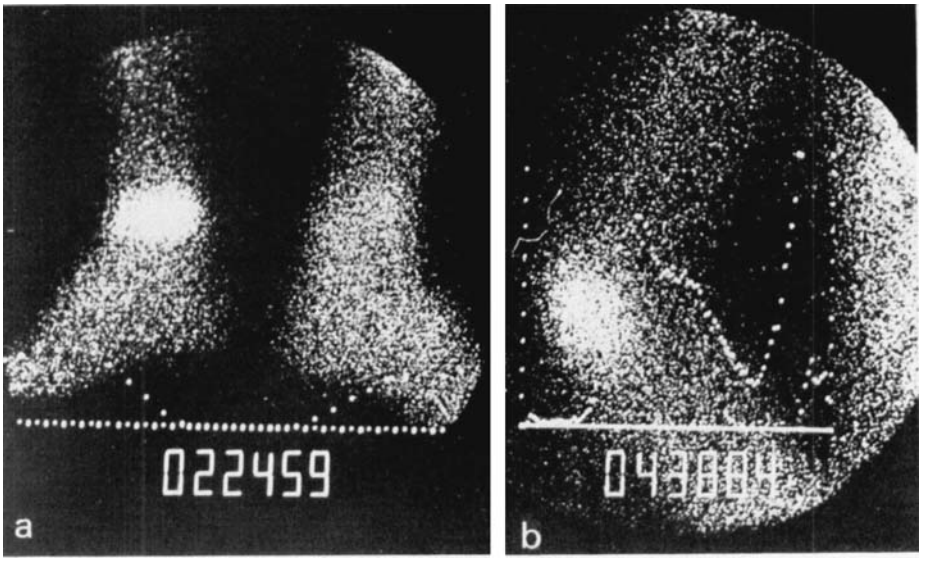

Figure 3. Enlargement of the right ankle (a) and the right elbow (b).

This increased fixation varies according to the degree and extent of the lesions, and the existence of a recent haemarthrosis.

Scintigraphic data were correlated with the age of the patients, the frequency of haemarthroses, and the X-rays of the joints. Elbows, knees and ankles present the highest number of positive findings (Table 3). A possible explanation for this phenomenon could be that these joints have the highest incidence of lesions. Shoulders and hips are less often positive, possibly because of lack of mechanical stresses of the shoulders, and because of the limited volume of haemarthroses of the hip.

The results of clinical, radiological and

Table 3. Haemophilic arthropathy surveyed with whole-body gamma-camera scintigraphy.

Joints	Haem-arthroses	Stiffness	X-rays positive	Scinti-graphy positive
Shoulders	34	7	16	18
Elbows	57	30	24	41
Hips	27	6	12	6
Knees	64	43	54	57
Ankles	57	30	36	47
Total	239	116	142	169

scintigraphic examinations revealed scintigraphy-detected lesions in 169 joints, radiological findings in 142 joints, and 116 joints on clinical examination (with limitation of movement). Radiography, when compared with scintigraphy presents a sensitivity of 84 per cent, and clinical examination (i.e. limitation of movement) a sensitivity of 68 per cent.

DISCUSSION

The study of our material leads to the following comments. Stiff joints presented an important degree of tracer fixation which is probably due to the severity of existing bone lesions and also to some osteoporosis. It was thus noted that a number of knees and ankles with no previous haemarthroses presented a high fixation of the tracer, although in these cases, the X-rays were found to be negative. Mechanical reasons could probably account for this phenomenon, i.e., increased stress on the load-bearing articular surfaces resulting in a local reinforcement of the trabeculae along the trajectories of the principal stresses.

In young patients with a recent haemarthrosis, a high tracer fixation was noted, accompanied by negative X-rays (Figures 4 and 5). In cases of chronic haemophilic arthropathies, both scintigraphy and radiography were positive (Figures 6 and 7).

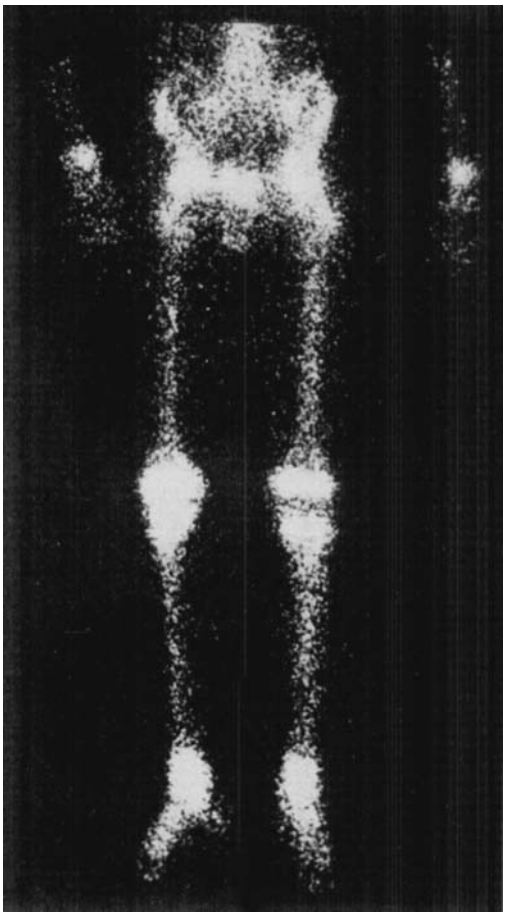

Figure 4. Scanning of the lower limbs of a young haemophiliac, showing repeated haemarthroses of the right knee and both ankles. Compare the degree and appearance of the fixation in both knees.

Although it is certain that chronic haemophilic lesions can be correlated with intra-articular haemorrhages, the mechanism leading to arthropathy is not clear. A variety of factors should be taken into consideration such as the findings from histological material, the radiological changes, and the results from experimental studies. Radio-isotopes could be a valuable contribution in any morphological and dynamic study.

A number of patients showing unilateral affection of the knee underwent

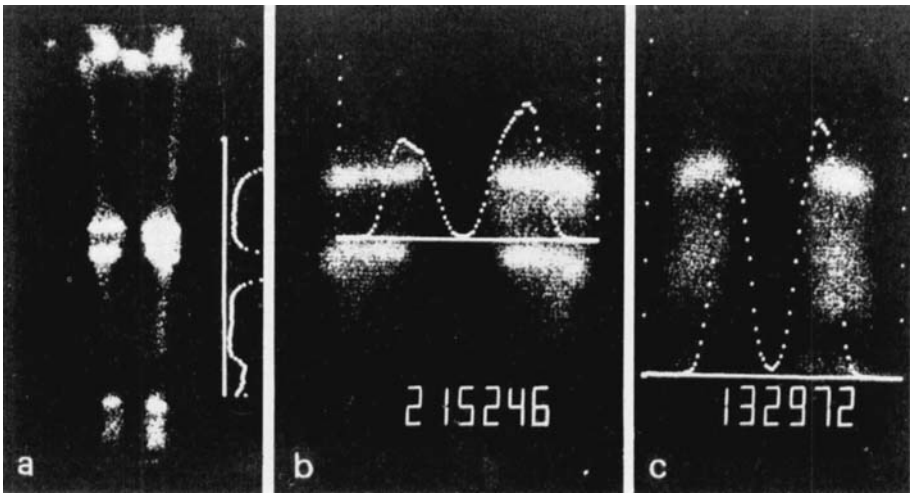

Figure 5. Scanning of the lower limbs of a young haemophiliac, with repeated haemarthroses of the left knee and ankles (a). Quantitative study. The uptake curve is higher in the attacked knee (b). The curve was obtained by measurement of the uptake by a mini-computer. Fixation curves at both ankles (c).

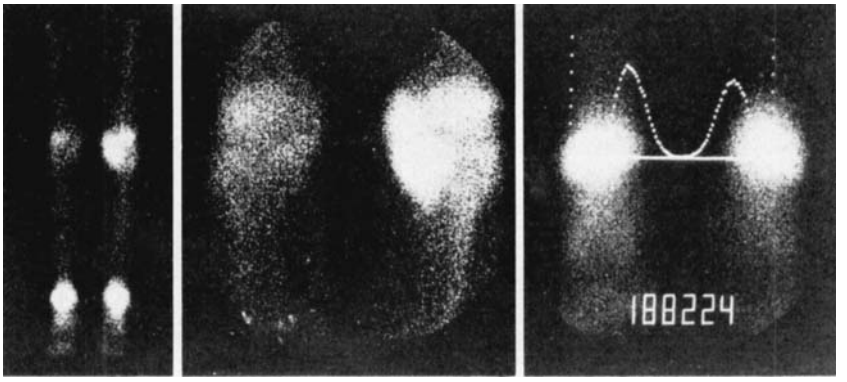

Figure 6. Knees and ankles of a haemophiliac with chronic arthropathy.

a dynamic study of the fixation of the tracer for a period of 60 min. Two areas of equal interest in the knees were chosen, and with the histograms the number of counts for each knee from 1 to 5 min and 56 to 60 min was calculated. The ratio of the two figures was considered as a parameter indicating the rate of tracer fixation in each knee. With the study of the fixation curves (which is the subject of a current project) one could suggest that a recent haemarthrosis produces a high tracer fixation. This could be the result of a reactive hypervascularization, whereas the final fixation seems to be the result of a metabolic disturbance.

The advantages of the exposed method of Scintigraphic survey are its sensitivity, speed and safety. As disadvantages one could point out that this method is not specific and therefore presents minimal diagnostic value, and that it does not produce detailed pictures when compared with radiography.

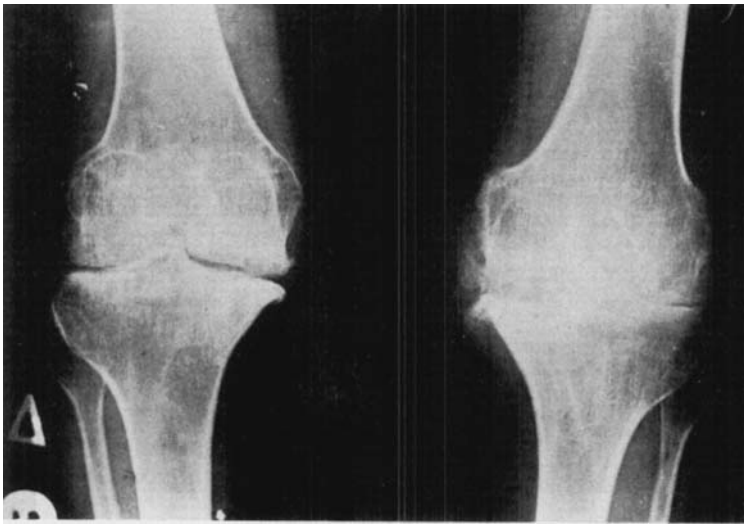

Figure 7. Radiographs of the same patient.

CONCLUSIONS

Whole-body gamma-camera scintigraphy presents valuable assets when compared with the classic methods of survey of haemophilic arthropathies. In a relatively short time all involved joints can be safely assessed. This survey presents great interest for the follow-up of the lesions, the prevention of relapses, and the assessment of results of treatment.

REFERENCE

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