2. Radiological, isotopic and thermographic studies in rheumatic arthritis

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SUMMARY. Due to the results obtained by comparing the radiological, scintigraphical and thermographical findings, it is stressed that thermography represents a valuable adjunct to the diagnosis of rheumatic diseases. It is useful for assessing the localization, extent and course of inflammatory joint disease. The evidence of restricted peripheral circulation may, in due course, help in a fuller understanding of the early stages of the rheumatic diseases.

Key ,words: thermography; rheumatic arthritis; methodologic comparisons.

Radiological 'investigations for the rheumatic diseases normally demonstrate processes which have already changed the bone structure and its calcium salt content, e.g. only a demineralization of 30% to 50% can be demonstrated radiologically. For this reason attempts are made to demonstrate earlier stages of osseous transformation using osteotrophic radionuclides.

99 mTc-polyphosphate-scintigraphy is ba-

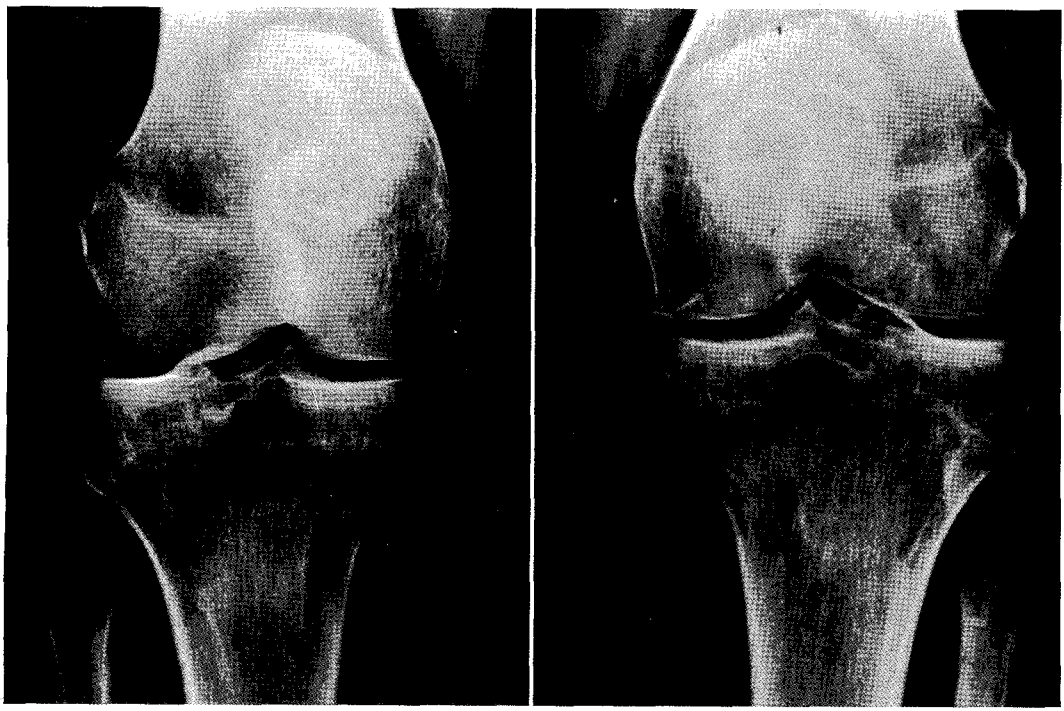


Fig. 1. Case 1. X-ray: Arthrosis of both knees, more on the left side.

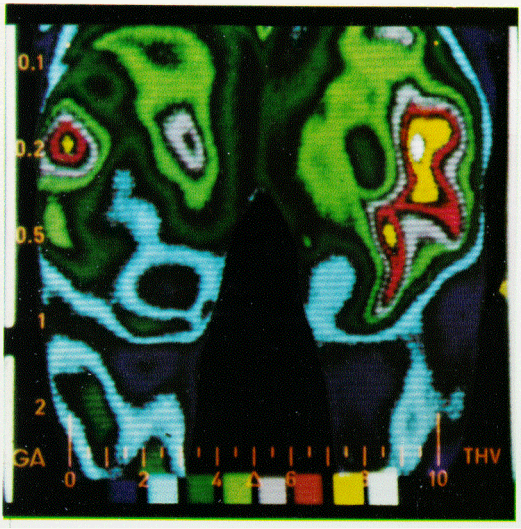
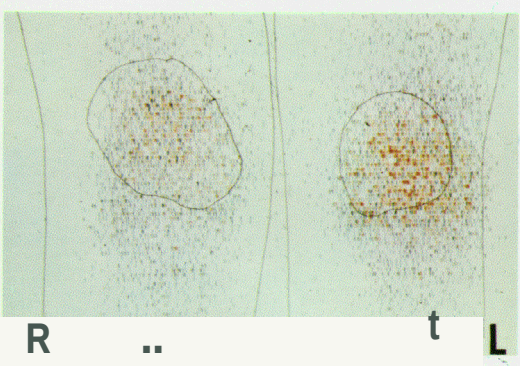


Fig. 2. Case I. Corrcaponding thermogram: intlammatory changea on both aides in the lateral parts of the kneea, increased on the left.



Elg. 3. Case 1. Corresponding scintlgram: incrcascd radionuclide uptake on the left side. also in the lateral pat 01 the knee.

sed on an unspecific radionuclidc accumulation in regions of increased bone transformation. In rheumatic diseases, an additional storage in the inflamed joint occurs due to changed vascularisation and permeability produced by synovitis. In bone scintigraphy through a single isotope application all joints are subject to an essentially lower radiation exposure than in a corresponding radiological examination.

Thermography does not involve radiation exposure at all. Its applicability depends on the inflammatory rheumatic process leading to an increased infrared radiation and a raised vascularization.

We tested thermography as an independent method in a randomly selected patient group suffering from rheumatic diseases. For the purpose of the routine programme, hands, knees and feet of the patients were examined. The other joints were only considered in the cabe of complaints.

The inflammatory rheumatoid **process can** bc well demonstrated on knee, hand and foot joints. Demonstration on shoulder and hip joints, however, is limited due to the overshadowing of the soft tissue layers. In many cases, however, even in these joints the changes can be recognized.

Inflammation is marked by hyperthermia or hypcrvascularization of the joint which correlates with the extent and intensity of the rheumatoid disease. Exact localization is possible where small or medium changes correlate with the scintigraphic findings (Figs. 1, 2, 3: Case 1; Figs. 4, 5, 6: Case 2). In extensive pathological processes, the thermographic changes are so distinct that single areas of joints cannot be differcntiatcd.

Marked changes in the thermogram are observed by the time early radiological changes are been (Figs. 7, 8: Case 3).

Thermographic diagnosis can also be established when radiological joint ashebbrncnt is no longer possible due to anatomcal abnormalities. Following replacement of the **lwx joint** by an endoprosthcsis, only the function of the prosthesis can be assessed radiologically and not the inflammatory process. Thermography confirms not only the pathological findings, but substantiates the therapeutic success during control after therapy. In the x-ray picture, the assessment of the osseous structure **is** inhibited by the overshadowing of the endoprosthesis, but in the thermogram the prosthetic non-inflamed joint presents a normal thermographic appearance (Figs. 9, 10, 11: Case 4).

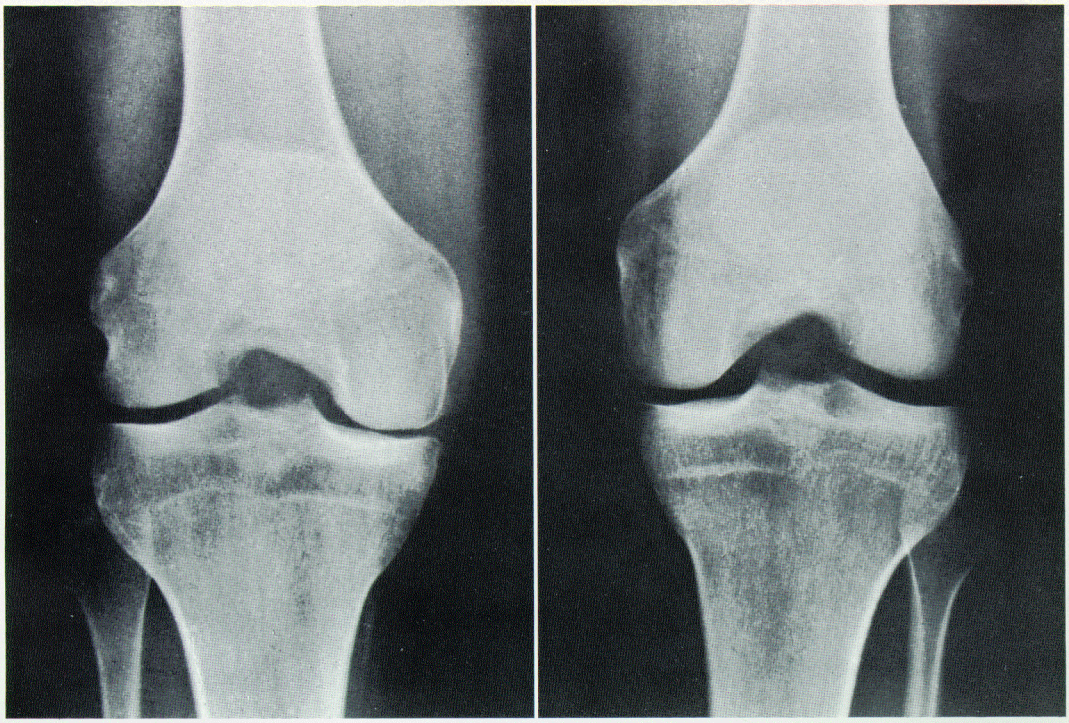


Fig. 1. Case 2. X-ray Onlv slighi natrowing ot the artlcular apacc on the right.

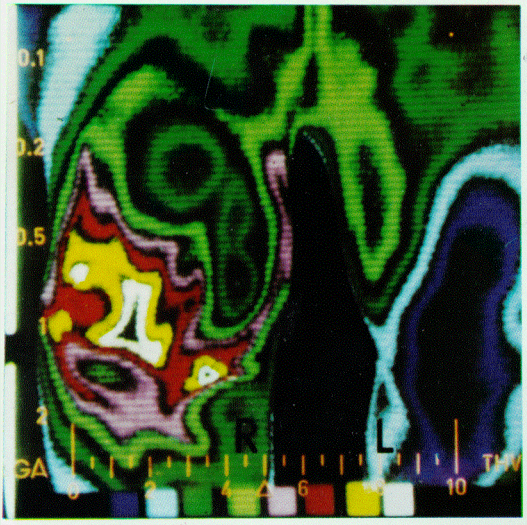


Fig. 5. Cast 2. Thermogram: Severe gonarlhritis un the right, mainly lateral.

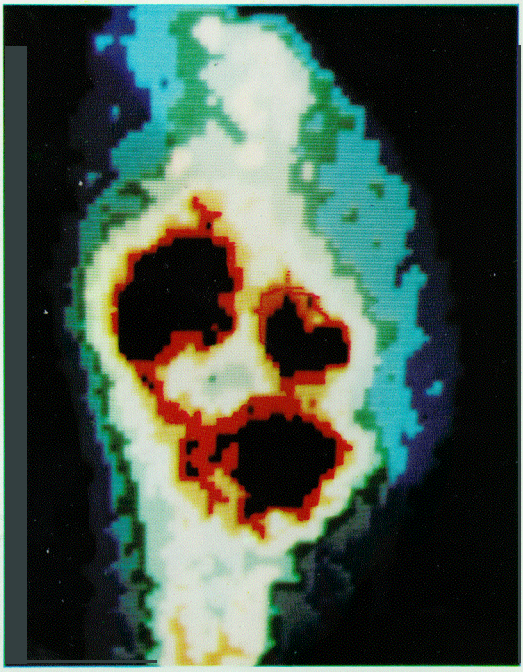


Fig. 6. Case 2. Scintigram increased radionuclidc uptake (right).

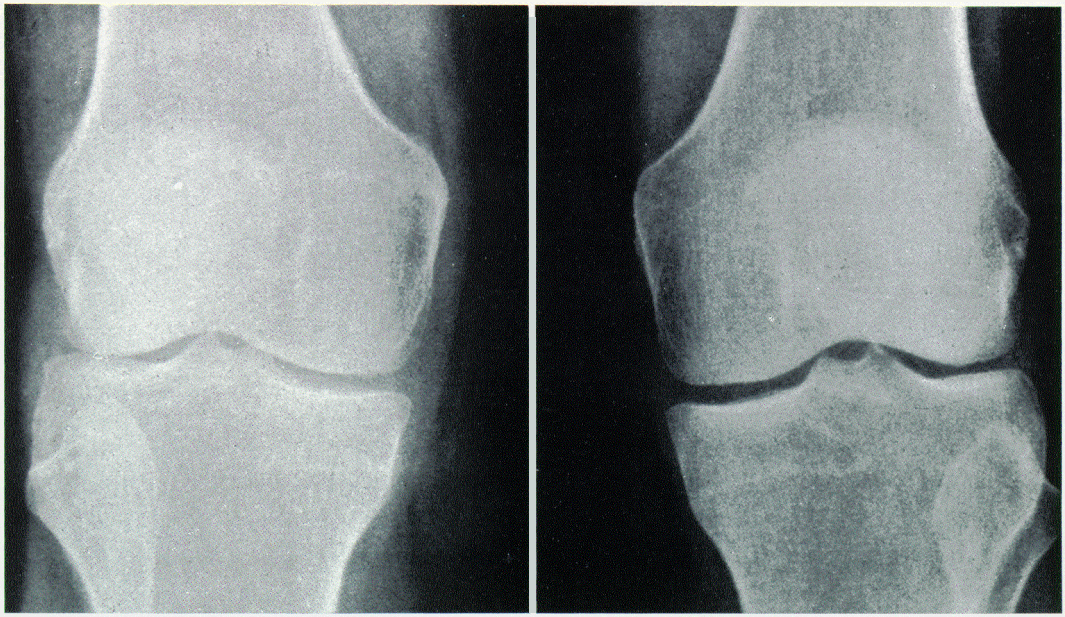


Fig. 7. Case 3. X-ray: Only slight asymmetry of the articular space on the right.

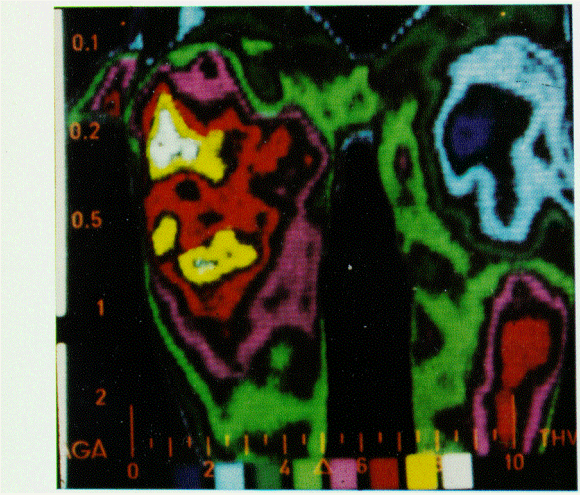


Fig. 8. Case 3. Thermogram: Severe inflammation of the right knee.

Thermography is able to either demonstrate or exclude additional inflammation in gross arthritic changes (Figs. 1, 2, 3). Degenerative articular changes, however, can only be demonstrated by radiological examination. However, the combination of an inconspicuous thermogram with arthritic changes in the x-ray picture, does provide a thermographic baseline for the detection of an acute inflammatory episode.

In patients with rheumatoid disease, thermography can be used not only to exclude inflammation, but also demonstrate an underlying vascular process, thus sparing the patient time-consuming investigations which may be associated with considerable radiation exposure. A peripheral angiopathy, which occurs e.g. in Morbus Raynaud, can be well dcmonstratcd by this means, although not by x-ray or scintigraphy.

Since the thermographic diagnosis is based on assessment of the vascular system and local temperatures, it is impossible to demonstrate inflammatory articular changes, if there is an accompanying pathological process as e.g. a leg phlebothrombosis or an abnormal arterial process, as e.g. a gangrene.

In an extraordinary high percentage of our examinations, we were able to demonstrate significantly restricted peripheral circulation. This can only partly be explained by the age distribution of the group and the arteriosclerotic vascular process. These

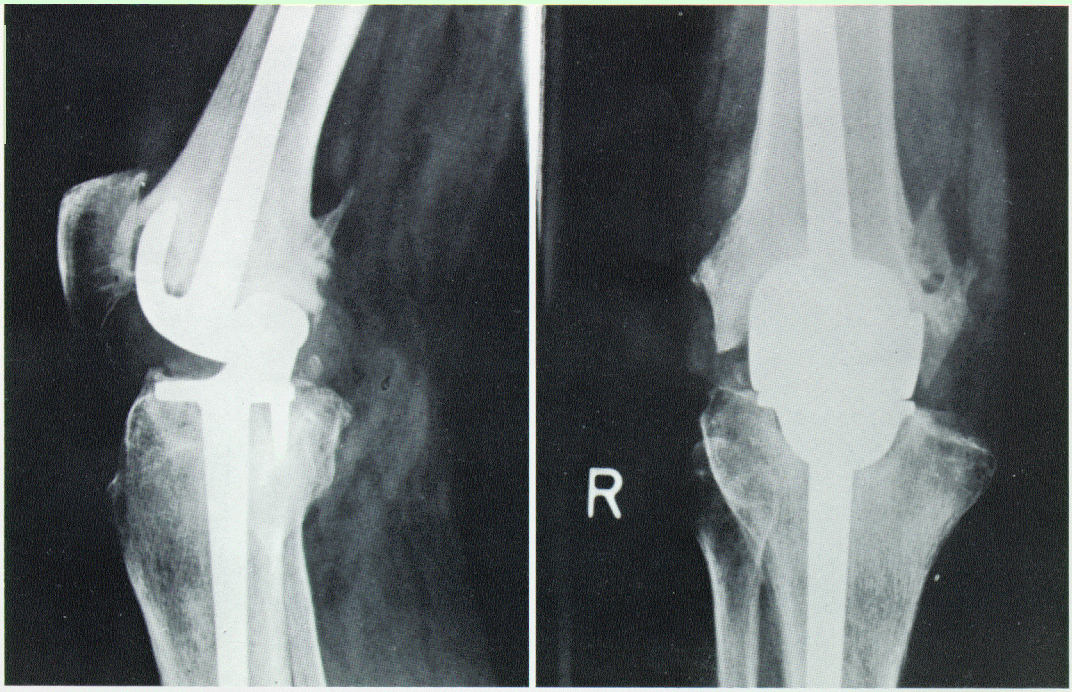


Fig. Y. Case 4. X-ray: 9 months after implantation of an endoprothesis.

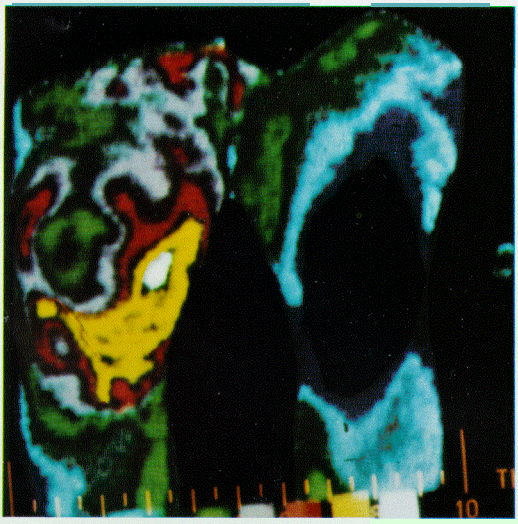


Fig. IO. Case 4. Thermogram: Persistent active arthritis in the right knee.

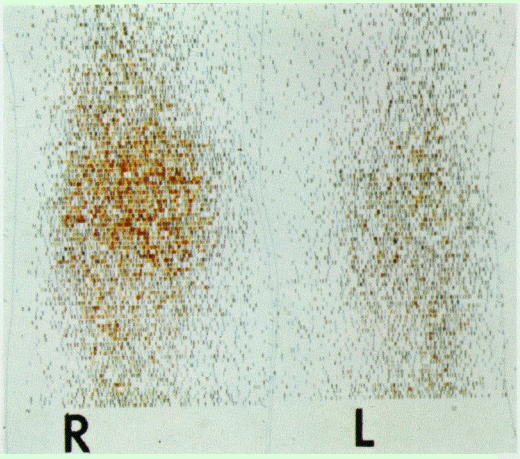


Fig. I I. Cast 4. Scintigram: Greatly increased uptake in the right knee.

findings are significantly increased in juvenile patients in whom the osseous processes were not shown by radiography or scintigraphy. We believe this to be a nonspecific early indication of a rheumatoid process affecting the peripheral vascular system. These results correspond with recent arteriographical and immunological studies.

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