

### Improved method for the detection and delineation of arthritis

*Dr. David Hawkins, a doctor in the Rheumatology Division of the Montreal General Hospital, one of McGill's teaching hospitals, has spent the last year investigating a new procedure which, when used in conjunction with other clinically-employed diagnostic methods, produces a clearer indication of the type and extent of many joint diseases.*

*The following excerpts describing the technique are from a recent issue of Research McGill:*

Pain is usually the earliest and primary manifestation of arthritis. Because of its highly subjective nature it is difficult to assess and yet it may be the only feature upon which the physician must base his diagnosis. In some patients obvious signs of joint inflammation or derangement may indeed be present but the full extent and pattern of the disease process cannot be determined. X-rays and blood studies are often helpful but tend to be less so in the earliest stages of these disorders. Thus the physician is frequently confronted with two problems: do the patient's aches and pains indicate the onset of real arthritis and if so what is its nature and degree of activity?

The basis of the detection method is the administration to the patient of a phosphate compound (polyphosphate) to which a radioactive tracer (the isotope, technetium) has been attached. The emissions from the isotope permit its localization to be established by scanning the patient with a special camera. The idea of using radiolabelled polyphosphates as a diagnostic procedure in patients with suspected joint disease originated with Dr. Leonard Rosenthal, the Director of the Division of Nuclear Medicine at the Montreal General Hospital.

Dr. Hawkins and his colleagues were aware that radiolabelled phosphate compounds had been widely used to detect bone disease, particularly the spread of tumour to bone, but had not been used in patients with joint disorders. Since arthritis is frequently characterized by changes in the bone adjacent to sick joints, they felt such compounds, which are "bone seeking", might localize in high concentration in these areas. It became clear after scanning a few such patients that the technique indeed was very successful for detecting early joint disease. Dr. Hawkins discovered that in some patients the polyphosphate scan actually showed abnormali-

ties in certain joints several weeks before the patient felt any symptoms in these areas. In every case of arthritis the polyphosphate isotope scan proved to be considerably more sensitive than any other single detection method. The results indicated that the early changes in bone near diseased joints resulted in increased uptake of the radiolabelled phosphate, sometimes well in advance of the appearance of symptoms.

#### Unexpected results

In the course of using polyphosphate for the detection of joint disease it was found by chance that the same labelled compound was highly sensitive in detecting certain metabolic bone diseases. Some patients with limb pain but no obvious bone or joint disease were scanned as a screening

procedure. Surprisingly, several of them had an extremely "hot" scan with striking accumulation of the radiolabelled phosphate in the bones near the joints. Because clinical and X-ray examination of their joints were entirely normal, it was considered that they might have a metabolic bone disease. Interestingly, the biochemical studies which are normally used to detect such disorders of metabolism were also normal. Nevertheless, because of the highly abnormal scans, a bone biopsy was performed and it was discovered that two of these patients had quite severe metabolic bone disease. Without the scan their disorder might have gone on undetected for some time. Furthermore, these preliminary results suggested that the scan was more sensitive than many of the currently employed biochemical diagnostic methods.

The scanning process has one notable disadvantage — what it gains in sensitivity it loses in specificity. While it detects joint inflammation very readily it does not indicate the type of inflammatory process. In some patients, therefore, X-rays may still prove to be the most useful diagnostic tool while in others clinical examination alone may suffice. But it is thought that, if not sufficient in itself, polyphosphate scanning can nearly



*Shown above is the hand of a patient with rheumatoid arthritis. Photo on left shows older scanning technique. Photo on right shows poly-*



*phosphate scan. Regions of increased isotope uptake, indicating disease, are more clearly defined with the newer procedure.*