Prevalence of periarticular calcifications in pyrophosphate arthropathy and their relation to nodal osteoarthritis

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SUMMARY X-rays of the shoulder, hand, and knee joints from 30 patients with pyrophosphate arthropathy (PA) and 30 age and sex matched control subjects were examined for periarticular, dense, homogeneous calcifications considered to be apatite deposits. They were found in 30% of the patients with PA compared with 3.3% of the controls. In addition in the PA group the incidence of Heberden's nodes was significantly increased in cases with periarticular calcifications, implying that mixed (calcium pyrophosphate dihydrate + apatite) crystal deposition disease could be related to nodal osteoarthritis.

Apatite crystal deposits are the commonest cause of dense calcifications affecting the periarticular areas (tendons, bursae, ligaments).¹ Apatite crystals may be found intra-articularly giving rise to chronic or acute inflammation.²⁻³ Recently both apatite and calcium pyrophosphate dihydrate (CPPD) crystals have been shown to coexist in the synovial fluids of patients with chronic osteoarthritis.⁴⁻⁵ These data prompted us to make a prospective clinical and radiological study of the incidence of periarticular calcifications in patients with pyrophosphate arthropathy (PA) (also referred to as CPPD crystal deposition disease or chondrocalcinosis) in comparison with a control group without PA.

Patients and methods

Patients with pyrophosphate arthropathy. This group consisted of 30 consecutive unselected patients, 22 women and 8 men, whose mean age was 73 years. They were in- or outpatients of the University Rheumatology Centre of Lausanne. The diagnosis was based on the presence of typical radiological features in 14 patients,⁶ on radiological features plus intracellular positive birefringent crystals in synovial fluid in 16. Twenty-eight cases of PA were idiopathic, one was associated with gout, and one with hypothyroidism. The presence of clinical signs of

degenerative joint disease such as Heberden's and/or Bouchard's nodes was recorded in each patient.

Controls. This group included 30 patients taken randomly from various categories of medical disorders; they were matched for sex and age. None had radiological signs of PA on the x-rays of the hand and knee joints.

Fasting blood sugar and tests of renal function were performed in each case. In view of the increased incidence of periarticular calcified deposits in diabetes mellitus, chronic renal insufficiency, and scleroderma,¹ patients with these diagnoses were excluded from the study.

INVESTIGATION OF PERIARTICULAR APATITE DEPOSITION

In all patients standard anteroposterior radiographs of the hand, knee, and shoulder joints were obtained, since these areas are the most commonly affected by periarticular calcifications⁷ and a complete radiological articular survey would pose ethical and financial problems. Xeroradiographs were performed in some cases in order to have a better definition of the soft tissues.

Round or oval periarticular calcifications, homogeneous in appearance, 2 mm in length at least, were recorded. It has been shown that this kind of calcifications corresponds to apatite crystal deposits.⁸⁻¹⁰ Radio-opaque deposits with a trabecular pattern, considered to be ossified masses, as well as linear elongated calcifications along the tendons,

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which are strongly suggestive of extra-articular CPPD crystal deposits,¹⁰⁻¹² were not recorded.

Results

As can be seen from Table 1, radiodense homogeneous periarticular calcifications were significantly more frequent in the group with PA than in the control group. These calcifications affected 1 joint in 2 cases, 2 joints in 2 cases, and 3 or more joints in 5 cases. The supraspinatus tendon was involved in 4 patients (Fig. 1). Distal interphalangeal joints (DIP) were involved in 6 patients, proximal interphalangeal in 3, and metacarpophalangeal joints in one. The sex ratio was 6 women to 3 men, and the mean age was 77.4 years (for comparison, the mean age of 21 patients without calcific deposits was 71 years). Synovial fluid was tapped in 5 cases; weakly positive birefringent crystals were found in each. Identification of hydroxyapatite crystals in the synovial fluid was not attempted. One of the patients had recurrent pseudogout attacks. One suffered occasionally from hot Heberden's nodes (in the DIP joints having calcified deposits in the vicinity). One patient had a destructive arthropathy of the shoulder joints, with a rupture of the right rotator cuff, the radiological picture being similar to that described in Milwaukee shoulder.¹³ Associated diseases were obesity (3 cases), gout (1 case), ankylosing vertebral hyperostosis (3 cases), and carpal tunnel syndrome (1 case).

As can be seen from Table 2, Heberden's nodes were present in all 9 cases with periarticular calcifications. Two of them suffered from erosive osteoarthritis of the DIP joints. The incidence (100%) is statistically significantly higher than in the patients without calcifications (28%).

Table 1 Incidence of periarticular calcified deposits

Area affected	Group with pyrophosphate arthropathy, 30 cases (22 F, 8 M), mean age and range 73 yr (40-80)		Control group, 30 cases (22 F, 8 M), mean age and range 72.5 yr (41-81)	
	No.	%	No.	%
Shoulder	1	3.3	—	—
Hands	5	16.6	—	—
Shoulder + hands	3	10	1	3.3
Total no. with periarticular calcifications	9	30	1*	3.3

*Significantly different from the group with pyrophosphate arthropathy ($p=0.006$, Fisher's exact test).

In the control group 10 patients suffered from Heberden's nodes (33%). This percentage is not significantly different from the group with PA. Periarticular calcified spots were found in one case only—an 81-year-old woman with Heberden's nodes.

Fig. 1 Xeroradiograph of the right shoulder of a 74-year-old woman with pyrophosphate arthropathy and osteoarthritis. Two types of calcifications can be seen: (1) dense homogeneous calcifications at the insertion of the supraspinatus tendon, which are characteristic of apatite deposition; (2) fine linear and punctate calcifications in the supraspinatus tendon and at the insertion of the long head of the biceps. This radiographic aspect is characteristic of CPPD crystal deposits in tendons.

Table 2 Incidence of Heberden's nodes in patients with pyrophosphate arthropathy with and without periarticular calcifications

Presence of Heberden's nodes	Cases with calcifications (9 cases)	Cases without calcifications (21 cases)	Significance*
No. of cases	9	6	
Percent	100	28.5	$p<0.001$

*Fisher's exact test.

Discussion

In PA fine linear calcifications can be observed on radiographs of the Achilles, triceps, quadriceps and supraspinatus tendons.¹⁰⁻¹⁴ Detailed histological and crystallographic studies have shown these linear calcifications to consist of CPPD crystals.¹⁰⁻¹² By contrast, radiodense nummular and homogeneous calcifications have been shown to result from apatite crystal deposition.⁸⁻¹⁰ They are the commonest type of extra-articular calcifications,¹⁻⁷ and they are the kind of calcifications which we have recorded in the present study.

Our results clearly suggest that the incidence of radiodense periarticular calcifications is increased in patients with PA, in comparison with sex and age matched patients without PA (Table 1). This implies that periarticular apatite deposition is more frequent in patients with PA.

From the identification of microcrystals in the synovial fluids an association between CPPD crystal deposition disease and apatite deposition disease has been substantiated, particularly in elderly patients suffering from osteoarthritis.⁴⁻⁵ The present results, based on clinical and radiographic studies, provide confirmation of an association between PA and periarticular apatite deposition in persons of advanced age. Furthermore the patients in our series with PA and periarticular calcifications suffered from nodal osteoarthritis, as in the cases reported by Dieppe *et al.*, whose synovial fluid contained mixed crystal deposits.⁴ Heberden's nodes were found in 100% of them in contrast to 28% of patients without periarticular calcified spots (Table 2). Hence it could be argued that periarticular calcifications were associated with nodal osteoarthritis but not with PA. However, in our control group the incidence of Heberden's nodes was not significantly different from that of the group with PA, which seems to tell against this hypothesis.

These data support the view that an association may exist between PA and periarticular apatite deposition and that both conditions may have aetiological factors in common, as previously suggested.¹⁵ Furthermore our results are compatible with mixed crystal deposition disease being related to the presence of Heberden's nodes and advanced age.

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