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AB0934 DUAL-ENERGY COMPUTED TOMOGRAPHY IN GOUT PATIENTS: IS IT USEFUL IN GENERAL PRACTICE?

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Background: Dual-Energy CT (DECT) has high sensitivity and specificity for detecting monosodium urate (MSU) crystal deposition. Although widely used in research, few studies have evaluated the usefulness of DECT in clinical practice.
Objectives: To evaluate the use of DECT in a clinical setting and determine its utility
Methods: We retrospectively evaluated the records of all patients referred for DECT scans over a 6.5-year period. Patient charts were reviewed for clinical features.
Results: 113 patients (17.5/yr) received DECT evaluation at a university hospital over the study period (234 scans). All were referred by rheumatologists. Medical records were available for 69 patients (134 scans), including 44 males and 25 females (mean age 62 (SD, 12.9, range: 34-85 yrs). Mean duration of gout was 6.7 (SD, 8.1) yrs. DECT was ordered to evaluate known gout (36/69, 52.1%), suspected gout (32/69, 46.4%), and suspected calcium pyrophosphate (CPP) disease (1/69, 1.4%). 32/69 (46.4%) of patients were on urate-lowering therapy. 61% (42/69) had MSU crystal and none had CPP deposition. Mean MSU volume was 1.6cc (SD, 5.2cc; range: 0.01-35 cc.) The joints imaged were feet/ankles (80/134, 60%) and hands/wrists (53/134, 40%). 23/33 (69.7%) patients with DECT positivity had elevated serum urate (SU) levels >6mg/dL; however, elevated SU was not significantly associated with DECT positivity (odds ratio (OR) 1.9, 95% CI:0.59-5.95, p=0.28).
For patients with positive scans, mean gout duration from first known flare was 9.5 (SD, 8.8) yrs.
Among patients who had scans completed within 1 yr of the first known gout flare, 1/10 were positive (10%); 4/16 within 2 yrs (25%); and 8/21 within 3 yrs (29.6%).
Of patients with positive DECT scans, 24/42 (57%) had symmetric distribution of MSU crystal deposition: 10/24 (42%) hands and 14/24 (58%) feet; with gout duration of 7.9 (SD, 8.0) yrs.
Conclusion: DECT was infrequently utilized and only by rheumatologists. Only 60 % of patients referred for DECT scanning because of known or suspected gout had MSU deposition. DECT was uncommonly positive in patients with a 1-3 yr history of gout. When positive, the MSU crystal deposition was symmetrical in most gout patients. DECT scans, while important in furthering our understanding of gout biology, are not routinely used in general practice and often do not provide important decision support information. Establishment of practice guidelines might be important in developing more appropriate utilization of DECT.
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AB0935 HYDROLYSIS OF INORGANIC PYROPHOSPHATE IN HUMAN SYNOVIAL FLUID BY IMMOBILIZED PYROPHOSPHATASES

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Background: Calcium pyrophosphate deposition (CPPD) disease, alternatively known as pseudogout, is a type of arthropathy caused by a deposition of microcrystals of calcium pyrophosphate (CaPPi) in joint tissues, particularly in fibrocartilage and hyaline cartilage. Up to date, specific treatment of CPPD disease has not been developed. Conventional therapy is focused on anti-inflammatory and immunosuppressive treatment aimed at the prevention of acute symptoms. Previously we suggested for this purpose inorganic pyrophosphatases (PPases) immobilized on nanodiamonds of detonation synthesis (NDs) [1]. We synthesized and characterized conjugates of NDs with PPases from *Escherichia coli* and *Mycobacterium tuberculosis* (Ec-PPase or Mt-PPase) using amino-substituted NDs with (ND-L) or without linker (ND-NH_2). The conjugates showed high enzymatic activity in the *in vitro* model system simulating the ionic composition of synovial fluid
Objectives: The present work is focused on testing enzyme-based agents for the partial dissolution of calcium pyrophosphate deposits in the synovial fluid of patients with CPPD disease.
Methods: PPase activity of soluble and immobilized PPases was evaluated as the rate of PPi decrease with time. 1 mM PP_i was added to the synovial fluid of patients with CPPD containing the samples of PPases, and the amount of PP_i in the samples was determined every 2-4 hours using ^{31}P NMR spectroscopy.
Results: We demonstrated the possibility of differential detection of pyrophosphate (PP_i) among the spectrum of phosphorus-containing compounds in the synovial fluid and used the rate of decrease of exogenous PP_i to estimate hydrolytic activity of PPases and PPase-based conjugates. The hydrolysis followed the first order reaction kinetics and the rate constants by different samples of PPases are presented in Table 1. Non-enzymatic hydrolysis of exogenous PP_i was quite moderate or not observed at all. Ec-PPase (both soluble and immobilized) showed very low hydrolytic activity with the residual PP_i levels above 80%. However, all samples of Mt-PPase showed significant hydrolytic activity. In two cases of three, PP_i was almost completely hydrolyzed within 20 hours. The maximum activity (2.24 U•mg^{-1}) was shown by Mt-PPase immobilized on ND-L. Hydrolytic activity for all studied enzymes is only 1-2% of such values under optimal *in vitro* conditions, most probably due to the inhibiting effect of calcium in synovial fluid. Nevertheless, the activity of Mt-PPase-based samples was comparable with the values typical for some classes of hydrolases. It allows us to consider the suggested PPase-based materials as promising agents for the hydrolysis of PP_i in the joint tissues *in vivo*.

Table 1. PP_i hydrolysis in the synovial fluid by soluble or immobilized PPases.

Samples		*k*, hr^{-1}	*A*, U·mg^{-1}
Control	-	0.010 ± 0.001	0
	ND-NH_2	0	0
	ND-L	0.013 ± 0.002	0
Ec-PPase	Soluble	0.025 ± 0.003	0.33 ± 0.04
	Immobilized on ND-NH_2	0	0
	Immobilized on ND-L	0.017 ± 0.003	0.22 ± 0.04
Mt-PPase	Soluble	0.10 ± 0.01	1.3 ± 0.1
	Immobilized on ND-NH_2	0.04 ± 0.01	0.53 ± 0.05
	Immobilized on ND-L	0.17 ± 0.02	2.2 ± 0.3

Conclusion: In this work, we applied the ^{31}P NMR spectroscopy to estimate the quantity of P_i and PP_i in synovial fluids of patients with CPPD disease. The conjugates of bacterial PPases with detonation nanodiamond were demonstrated to retain enzymatic activity in the hydrolysis of exogenous PP_i in human synovial fluid. These results provide the basis for the further tests of PPase-based conjugates on animal models *in vivo*.
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AB0936 CLINICAL STUDY ON PERIPHERAL BLOOD IMMUNE FUNCTION IN PATIENTS WITH GOUTY ARTHRITIS

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Background: Gout is an inflammatory disease characterized by hyperuricemia and recurrent arthritis. In severe cases, joint disability and renal insufficiency may occur [1]. In recent years, many studies have found that immune dysfunction plays an important role in the occurrence and development of gout [2]. Therefore,