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SAT0556

FINE STRUCTURE ANALYSIS OF THE INTER-RELATION BETWEEN TOPHUS DEPOSITION AND BONE LESIONS IN GOUT USING A COMBINATION OF DUAL ENERGY AND HIGH-RESOLUTION CT

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Background: Deposition of uric acid crystals cause an inflammatory reaction, which can lead to structural bone changes, if such deposits form adjacent to cortical bone [1, 2]. Both erosions and bony spurs can form in conjunction with tophus deposition. The exact spatial inter-relation between tophi and structural bone lesions in humans in vivo is not fully characterized.

Objectives: To spatially relate structural bone changes (erosions, osteophytes) to the deposition of monosodium urate crystals in the first metatarsophalangeal (MTP1) joint in patients with tophaceous gout.

Methods: Tophaceous gout patients with clinically detected tophi at the MTP1 joint underwent simultaneous dual energy computed tomography (DECT) and high-resolution peripheral quantitative computed tomography (HR-pQCT) of the feet. Tophi detected by DECT and erosions and osteophytes detected by HR-pQCT were overlaid to define their exact anatomical relation. Furthermore, feet of sex- and age-matched healthy controls (HC) were scanned to define the normal architecture of the MTP1 joint.

Results: Gout patients (N=20) had significantly higher numbers (5 (0–17 vs. 1 (1–2)) and volumes (45.32 mm³ (7.26–550.32) vs. 0.82 mm³ (0.15–21.8)) of bone erosions as well as significantly higher numbers (10.5 (0–26) vs. 1 (0–10)) and sizes of osteophytes (4.93 mm (0.77–7.19 mm vs. 0.93 mm (0.05–7.61 mm)) than healthy controls (N=20). Erosions were in direct spatial relation to bone erosions, while osteophytic responses were more widespread and affected bone regions on the MTP1, which were not directly adjacent to tophi. Median tophus volume detected by DECT (0.12 mm³ (0.01–2.53)) was associated with the total volume of erosions (r=0.597, p=0.005).

Conclusion: This study demonstrates that bone changes in gout are substantial and not only include erosions but also widespread architectural bone remodeling associated osteophyte formation. While there is a direct spatial relation between tophi and bone erosions the anabolic bone responses in gout are more widespread.

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Data are based on high-resolution peripheral quantitative computed tomography (HR-pQCT) of metatarsophalangeal joints I in gout patients (grey boxplots) and healthy controls (white boxplots). (A) number of bone erosions, (B) volume of

bone erosions, (C) number of osteophytes and (D) size of osteophytes. Data are shown as medians and inter-quartile ranges (boxes).

Distribution of (A) tophi based on dual-energy computed tomography (DECT) as well as (B) bone erosions and (C) osteophytes based on high-resolution peripheral quantitative computed tomography (HR-pQCT) of metatarsophalangeal (MTP) I head in gout patients. Data are shown for the different regions of the MTP1 head including the plantar, medial, dorsal and lateral region of the metatarsal head, as well as the medial and lateral sesamoid bones. Data indicate percentage of patients with tophi, erosions and osteophytes in respective region.

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SAT0557

RESIDUAL DISEASE ACTIVITY IN ADULT-ONSET STILL'S DISEASE: QUALITATIVE AND QUANTITATIVE ANALYSIS OF A SERIES OF 18F FDG-PET/MR

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Background: Adult-onset Still's disease (AOSD) is a systemic autoinflammatory disorder characterized by episodes of spiking fever, the presence of an evanescent pink-salmon rash, arthritis/arthralgias, sore throat and increased inflammatory serum markers. The diagnosis is clinical and needs the exclusion of potential mimickers such as infections and lymphoproliferative disorders. Currently, a specific diagnostic test to assess the disease activity is not available.

Objectives: To define the residual disease activity in AOSD and establish a possible response to therapy through ¹⁸F-FDG PET/MR imaging technique.

Methods: 23 patients affected by AOSD and 24 controls underwent ¹⁸F-FDG PET/MR between 2014 and 2018. A total of 54 ¹⁸F-FDG PET/MR were analysed. AOSD patients were diagnosed according to the Yamaguchi's criteria and were in follow-up at the Rheumatology Unit of Padova University Hospital. The controls were chosen among non-AOSD patients with a previous diagnosis of solid tumors (lymphomas excluded). A qualitative analysis of PET/RM carried out by a Nuclear Medicine Specialist and a semiquantitative analysis carried out by measuring SUVs-to-liver (Standardized Uptake Value) for spleen, bone marrow (BM), lymph nodes and pharynx were performed. A SUVmax BM/SUVmean liver higher than 2.09 was set up as significant area of uptake for each organ considered. This threshold was calculated by adding the standard deviation multiplied by 2 at the mean ratio between SUVmax BM and SUVmean liver of the control group. The Pouchot score for disease activity was calculated for each subject. The distribution of the variables was investigated by Shapiro-Wilk test. The analysis of the association between the variables was carried out using the Mann-Whitney U test.

Results: AOSD patients present areas of focal ¹⁸F-FDG uptake mainly in BM, lymph nodes, pharynx, spleen and salivary glands. Sites of uptake in spleen were found in 3.3% of PET/MR, in BM in 23.3%, in lymph nodes in 23.3% and in pharynx in 36.6% of PET/RM respectively. Eleven/thirty (47.8%) patients were

defined as "positive" since the uptake was higher than liver, and twelve/thirty (52.2%) were defined as "negative" since the uptake was lower than liver, regardless of SUVs and clinical manifestations. A semi-quantitative analysis assessed whether the values of the SUVmax BM/liver were higher than the cut-off of 2.09 in "positive" PET/MR and lower in the "negative" ones and if the clinical manifestations were present or absent in agreement with the evaluation of SUVs for each patient. BM was found to be active (SUVmax ratio > 2.09) in 7 out of 11 patients when the PET/MR was defined "positive", while only in 1 case out of 12 BM SUVmax was >2.09 when the exam was "negative". Clinical manifestations were present in 10 out of 11 AOSD with a "positive" scan and in 7 out of 11 with both a "positive" scan and a SUV max BM/liver >2.09. Clinical manifestations were present in 1 out of 12 patients with a "negative" scan, while in 10 out of 12 cases with both a negative scan and a SUV max BM/liver <2.09 were absent. Six patients repeated PET/MR during follow-up. The values of the SUVmax BM/liver significantly decreased after anti IL-1 β treatment with anakinra. In two cases in which anakinra was deferred, the BM SUVmax values exceeded the cut-off of 2.09 despite the patients did not complain any symptom or inflammation markers increase.

Conclusion: ^{18}F FGD-PET/MR could be able to evaluate the disease activity in AOSD when clinical manifestations and serum markers are not sufficient to establish it. The uptake on BM seems quite sensitive in pointing out the disease severity and in assessing the response to anti IL-1 β therapy. ^{18}F PET/MR is an accurate and repeatable method, however further studies are required to validate its applicability in routine clinical practice.

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SAT0558

THE IMPACT OF A STANDARDIZED TRAINING PROGRAM FOR IMPROVING THE RELIABILITY AND AGREEMENT – A STUDY OF VASCULAR ULTRASOUND FOR DIAGNOSING GIANT CELL ARTERITIS IN DENMARK

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Background: Due to a high level of evidence of good test performance, accessibility, minimal invasiveness, low cost, and good overall performance, EULAR recommends ultrasound (US) of the temporal and axillary arteries as primary diagnostic imaging test in patients suspected of Giant Cell Arteritis (GCA) (1). Despite the growing body of evidence supporting the utility of US in GCA, standardized training programs and their impact on reliability are lacking (1). In TABUL study (2), the only US study published to date using a standardised US training program, the interobserver agreement by 12 different sonographers was only moderate, illustrating the challenges presented in the education for US in GCA.

Objectives: To evaluate the impact of a standardized training program including equipment adjustment on the agreement and reliability of US in the diagnosis of GCA for experienced musculoskeletal (MSK) ultrasonographers, without previous experience on vascular US.

Methods: Five rheumatologists with long-standing experience in MSK US were trained by a standardized training program including equipment adjustment (Box 1) prior to a prospective, non-interventional observational study in patients suspected having GCA. The rheumatologist performing the US subsequently evaluated the images blinded to the patients data. Thereafter the images were evaluated by a blinded external expert (i.e. considered the gold standard).

Results: In three Danish centers 112 patients were included, 59% females, mean age 72.4 (SD) 7.9 years and median CRP 55 (IQR 21-100)mg/l. Median duration of prednisolone treatment prior to US examination was 0 (IQR 0 to 1) days. 92% of the patients reported a newly emerged localized headache.

The reliability between the performing ultrasonographer and the US expert for the overall GCA diagnosis, as for the diagnosis of cranial (c-GCA) and large-vessel GCA (Lv-GCA) was excellent. In addition, excellent reliability was also found for the US examination of all examined arteries (Table 1). According to the US expert, vasculitis changes were found in 66 patients with the pathological findings distributed as presented in table 1.

Table 1

Variables	Pathological findings (%)	Interobserver agreement (%)	Interobserver Reliability Kappa Coefficient	95% Confidence Limits
US positive for GCA	59% 66/112	96%	0.93	0.85-0.99
US positive for cGCA	53% 59/112	95%	0.89	0.81-0.98
US positive for Lv-GCA	19% 21/112	96%	0.89	0.78-0.995
Halo sign TA, all segments	51% 57/112	96%	0.91	0.83-0.99
Compression sign TA, all segments	48% 51/107	94%	0.89	0.80-0.98
Halo sign FA	20% 23/112	96%	0.87	0.75-0.98
Compression sign FA	16% 17/107	96%	0.86	0.73-0.99
Halo sign AA	18% 20/112	97%	0.91	0.81-1.00
Halo sign AC	4% 6/11	100%	1.00	1.00-1.00

TA: Temporal; FA: Facial; AA: Axillary; AC: common Carotid, artery

Conclusion: Our training program resulted in excellent reliability of US findings in patients suspected of having GCA and for the final diagnosis. The training program could be used when implementing vascular US in clinical practice.

Box 1

References:

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SAT0559

INCREASED FREQUENCY OF INTER- AND SUBMETATARSAL BURSITIS AND MORTON'S NEUROMA IN RHEUMATOID ARTHRITIS: RESULTS OF A LARGE CASE-CONTROLLED MRI STUDY OF FOREFEET IN PATIENTS WITH EARLY ARTHRITIS AND HEALTHY CONTROLS

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Background: The forefoot is a preferential location for tendon and joint inflammation in rheumatoid arthritis (RA). Some imaging studies suggested that intermetatarsal and submetatarsal pathology (such as bursitis and Morton's neuroma) are also involved in RA, but these studies were small and its association was not thoroughly explored.

Objectives: To determine whether intermetatarsal bursitis (IMB), Morton's neuroma (MN) and submetatarsal bursitis (SMB) occur more often in early RA, compared to patients with other early arthritides and healthy controls. Contrast-enhancement in the subcutis that has been described as diffuse submetatarsal alterations (DSMA) were also included.

Methods: In this cross-sectional cohort-study, consecutive patients with RA, other arthritides and healthy controls underwent MRI of unilateral forefoot. Two readers, a trained PhD-student and experienced MSK-radiologist, scored IMB, MN, SMB and DSMA in consensus, and measured transverse and dorsoplantar