FRI0671 ULTRA-HIGH FIELD MRI AND BIOMECHANICAL INVESTIGATION OF VERTEBRAL BONE MICROARCHITECTURE

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Background: Fracture risk prediction in patient relies chiefly on bone mineral density (BMD) measurement. However, the decreased bone strength characteristic of osteoporosis is dependent not only on BMD, but also on other factors, most notably bone microarchitecture.
Objectives: The purpose of this study was to investigate bone microarchitecture variables of cadaveric vertebrae using ultra-high field MRI (7 Tesla).
Methods: Twenty four vertebrae (L2, L3, L4) from eight cadavers were studied using 7 Tesla MRI. Their Bone Mineral Density (BMD) were investigated using dual energy X Ray absorptiometry. Then, all specimens underwent mechanical compression tests to failure and the failure load (in Newton) and constraint (in Mpa) were measured. Bone Volume Fraction (BV/TV), Trabecular Thickness (Tb.Th), and Trabecular Spacing (Tb.Sp) were measured in MR images using a Digital topological analysis (Bone J). Measurements were performed by two observators in order to characterize the inter-rater reliability. Statistical analyses were performed using SPSS. Correlations between variables were analyzed using Spearman correlations and Stepwise regression. A p value of 0.05 was considered as significant.
Results: The inter-rater reliability for bone microarchitecture parameters quantification was good. Tb.Th and Tb.Sp measured using high-field MRI were 0.52±0.18 and 0.48±0.10 respectively while the BV/TV fraction was 0.52±0.13. The mean BMD was 0.86±0.20 g/cm^2. The failure load and the constraint measured during the compression tests were 2600±1267N and 1.57±0.81 Mpa respectively. Interestingly, the variables measured during the mechanical tests were significantly
The failure load and constraint measured during the compression tests were significantly correlated with the BMD. Regarding the bone indices quantified using high-field MRI, a significant linear relationship was observed between the trabecular spacing and the BMD (R^2=0.23, p=0.01 and the constraint values to failure (R^2=0.18, p=0.04). A stepwise regression with backward elimination demonstrated that combining BV/TV and BMD improved the relationship with the constraints from an adjusted R^2=0.384 for BMD alone to an adjusted R^2=0.41 for BMD + BV/TV.
Conclusions: In the present study, we demonstrated for the first time that the variables characterizing the vertebral bone microarchitecture quantified using ultra-high field MRI were significantly correlated with biomechanical parameters. In addition, we illustrated that the vertebral bone strength was better described by a variable combining BMD and trabecular bone spacing.
Disclosure of Interest: None declared
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FRI0672 ASSESSMENT OF THE NAIL BED IN PSORIATIC ARTHRITIS (PSA) BY ULTRASOUND (US) AND MRI

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Background: PsA can be difficult to distinguish from osteoarthritis (OA) and the treatments vary greatly. Nail involvement can occur in about 15–50% patients with psoriasis[1], which may aid differentiation from OA. If US can reliably detect nail bed changes in early disease then it might be helpful in differentiating PsA from OA
Objectives: This study aims to investigate the nail bed changes seen in patients with PsA and OA using US and MRI, and to determine the impact of nail bed changes on quality of life (QOL).
Methods: Patients who fulfilled the CASPAR PsA or 1990 ACR OA classification criteria were recruited. At baseline, clinical assessment included patient and physician's visual analogue scale (VAS), tender and swollen joints, patient's Leeds Enthesitis Index and quality of life specific to nail psoriasis (NPQ10). Nail abnormalities on the dominant hand such as onycholysis, pitting, nail bed hyperkeratosis and nail bed crumbling were documented. Using US, each nail (1–5) was scored dichotomously for pitting/irregularity, loss of normal trilaminar appearance of the nail. Each nail was scored semi quantitatively for power doppler (PD) signal (0–3) in the nail bed, nail matrix and dermis, and assigned a total PD score. All patients had an MRI of the dominant 2nd to 5th finger.
Results: 14 patients were recruited; demographics, clinical and US detected nail changes are documented in Table 1. Clinical nail changes were not seen in the OA group, but were relatively common in the PsA group. In the PsA group, 54% of nails had US detected structural abnormalities; 12% pitting and 52% loss of trilaminar layer. Only 20% of OA nails had US detected abnormalities. There was a strong relationship between the presence of clinical nail change and US structural changes (chi square 10.769 df 1 p=0.001) but not PD signal score. There was no relationship between clinical or US detected nail scores and NPQ10, patient or physician VAS, swollen joint count or Leeds Enthesitis Index. MRI analysis is pending.

Table 1

	Total (n=14)	PsA (n=10)	OA (n=4)
Age (median (IQR))	56.5 (52.2–63.2)	55.0 (48.0–63.2)	61.0 (55.2–73.5)
Patient VAS (median (IQR))	29.0 (12.5–54.8	39.5 (19.8–54.8)	11.0 (3.8–54.2)
Physician VAS (median (IQR))	35.3 (20.5–57.5)	42.5 (24.5–57.5)	24.0 (4.8–53.8)
NPQ10 (median (IQR))	6.5 (1.8–10.0)	7.0 (5.2–10.2)	1.5 (0.2–5.8)
Swollen joint count (median (IQR))	2.0 (0.0–4.2)	1.5 (0.0–5.2)	2.5 (0.5–5.8)
Leeds Enthesitis index (median (IQR))	1.0 (0.0–2.0)	1.0 (0.0–2.0)	0.5 (0.0–1.8)
Percentage of nails with clinical abnormalities	27.7%	40.0%	0.0%
Percentage of nails with US structural abnormalities	44.3%	54.0%	20.0%
Percentage of nails with PD signal	97.1%	96.0%	95.0%

Conclusions: In this small prospective study, structural abnormalities detected by US appear to correlate well against clinical structural findings, but PD signal does not. No relationship was found between US findings and other clinical parameters. US structural abnormalities may be a better differentiator of PsA and OA than PD signal. MRI validation of these results is pending.
References:
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FRI0673 CLINICAL REMISSION IN TOCILIZUMAB-USING RHEUMATOID ARTHRITIS PATIENTS CAN BE OVERESTIMATED: A CROSS SECTIONAL STUDY USING ULTRASOUND SONOGRAPHY

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Background: Several clinical remission (CR) criteria of rheumatoid arthritis (RA) contain acute-phase reactants [C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR)] as their components. However, it is known that they can be underscored by the usage of tocilizumab (TCZ). This may cause overestimation of CR. On the other hand, ultrasound sonography (US) provides objective information independent of acute-phase reactants and assessment by physician and patient, and can detect synovitis in RA patients in CR, which is called sonographic residual synovitis (SRS).
Objectives: To assess whether CR of TCZ-using RA patients are overestimated, by using US.
Methods: We recruited 402 RA patients. Bilateral 2–5 MCP, wrist, ankle, and 2–5MTP joints were scanned by using the Aplio500 (TOSHIBA) with a 12 MHz transducer. Power Doppler (PD) images were obtained by Superb Micro-vascular Imaging (SMI). Gray scale (GS) and PD images were scored using a 0–3 semi-quantitative scale. Clinical information was obtained from the Kyoto University Rheumatoid Arthritis Management Alliance (KURAMA) database, which is based on the assessments by physicians who were blind to the US results. The patients were divided into 4 groups based on their treatment: tumor necrosis factor alpha inhibitors (TNFi), TCZ, abatacept (ABT), and non-biologic (non-Bio) users. Two patients treated by tofacitinib were excluded because the number was too small to analyze. The Boolean (BL)-based, Simplified Disease Activity Index (SDAI)-based, Clinical Disease Activity Index (CDAI)-based, and Disease Activity Score (DAS)28-ESR-based CR criteria were assessed using SRS.
Results: A total of 400 RA patients were analyzed. The number of patients in each treatment group is shown in the Table. When the BL-based, SDAI-based, and DAS28-ESR-based CR criteria were used, SRS in TCZ group was significantly stronger than the other groups (Fig 1–3). On the other hand, when CDAI-based CR criteria was used, the difference was not significant among 4 groups (Fig

	TNFi N=104	TCZ N=35	ABT N=42	Non-Bio N=219	P
Age, years	62.8±13.4	60.0±11.6	64.8±11.1	63.7±13.0	0.28
Sex (M/F)	14/90	8/27	2/40	48/171	0.03
Disease duration, years	12.3±11.6	12.0±11.3	11.5±9.5	13.1±11.2	0.75
Steinbrocker Stage (I/II/III/IV)	28/ 26/17/33	6/9/7/13	10/11/6/15	57/48/49/65	0.73
PhGA, mm	9.9±11.9	9.1±14.2	11.6±15.5	9.2±10.2	0.94
PtGA, mm	26.0±22.5	27.6±23.2	26.9±26.2	25.4±24.6	0.73
CRP, mg/dL	0.4±0.8	0.2±0.6	0.6±1.0	0.5±0.9	<0.01
ESR, mm/hr	22.8±18.6	11.2±11.5	26.7±19.2	22.8±17.6	<0.01
Tender joint count	0.8±1.3	0.7±1.5	1.4±2.9	1.0±1.6	0.27
Swollen joint count	0.8±1.6	0.7±1.1	1.3±2.6	0.9±1.8	0.94
Total GS score	11.1±5.7	14.2±8.1	12.5±5.9	13.9±7.4	<0.01
Total PD score	2.6±3.9	4.6±5.1	3.0±4.0	3.5±4.9	0.04
MTX, mg/week	6.0±4.2	4.2±4.6	3.0±3.6	5.4±4.1	<0.01
Prednisolone dose, mg/day	0.9±2.0	1.3±2.3	1.8±3.4	1.1±2.3	0.19

Mean ± SD.