assess differences in direction ($p < 0.0063$) and Gwet's AC1 score to determine interobserver agreement.

Results: Amplitude of the displacement of the ED tendons was statistically significantly higher in JA+ patients than in JA- patients and controls in flexion for both readers ($p < 0.0001$) and in extension for one reader ($p < 0.0048$). Ulnar deviation of the ED tendons was statistically significantly more frequent in JA+ patients than in JA- patients and controls in flexion and in extension for both readers ($p < 0.0001$). Interobserver agreement for the assessment of displacement was moderate to very good ($0.51 \leq \kappa \leq 0.93$).

Conclusion: JA is associated with abnormal displacement of the ED tendons in flexion and extension. Abnormal displacement of the ED tendons is absent in patients without JA.

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Figure 1. Axial spin echo T1-weighted images of a 49-year-old woman with SLE and JA (a) in flexion and (b) extension. In flexion, the extensor digitorum (ED) tendons of the 3rd and 4th fingers are completely displaced on the ulnar aspect of the metacarpal heads (white arrows) with no tendon visible on the dorsal aspect (arrowheads). In extension, the ED tendons of the 3rd and 4th fingers are slightly displaced on the ulnar side of the dorsal aspect of the metacarpal heads (black arrows).

Figure 2. Axial spin echo T1-weighted images of the sex- and age-matched control subject of the patient from Figure 1 (a) in flexion and (b) extension. The extensor digitorum tendons of the 3rd and 4th fingers are normally positioned on the dorsal aspect of the metacarpal heads in flexion (white arrows) and extension (black arrows).

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FRI0176 NON-HISTOLOGIC FACTORS DISCRIMINATING PROLIFERATIVE LUPUS NEPHRITIS FROM MEMBRANOUS LUPUS NEPHRITIS

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Background: The treatment strategy and renal prognosis between proliferative lupus nephritis (LN) and membranous LN are different. Therefore, it is important to distinguish one from the other. To date, data regarding non-histologic factors that can discriminate proliferative LN from membranous LN are limited.

Objectives: To investigate non-histologic factors that can discriminate proliferative LN from membranous LN in patients with systemic lupus erythematosus with renal manifestations.

Methods: Patients with biopsy-proven proliferative LN and membranous LN were included. Non-histologic factors were compared between the two groups. A logistic regression analysis was performed to identify the factors associated with proliferative LN. To assess the accuracy of these factors in discriminating

between proliferative LN and membranous LN, we performed a receiver-operating characteristic analysis.

Results: Of the total 168 patients with biopsy-proven LN, 150 patients (89.3%) had proliferative LN, and 18 patients (10.7%) had membranous LN. In the multivariable logistic regression analysis, positive anti-double-stranded DNA (anti-dsDNA) antibody (adjusted OR = 11.200, 95% CI = 2.202–56.957, $p = 0.004$) was associated with proliferative LN, while positive anti-U1RNP antibody (adjusted OR = 0.176, 95% CI = 0.040–0.769, $p = 0.021$) and higher glomerular filtration rate (GFR) (adjusted OR = 0.973, 95% CI = 0.951–0.994, $p = 0.013$) were inversely associated with proliferative LN. Among these covariates, the anti-dsDNA antibody (area under the curve = 0.806, 95% CI = 0.695–0.916) had the highest accuracy in discriminating between proliferative LN and membranous LN.

Conclusion: The positivity of anti-dsDNA antibody was associated with proliferative LN, while the positivity of anti-U1RNP antibody and GFR were inversely associated with proliferative LN. The anti-dsDNA antibody had a good accuracy in discriminating proliferative LN from membranous LN.

References: Not applicable

Table. Factors associated with proliferative LN

	Univariable analysis		Multivariable analysis	
	OR (95% CI)	p	OR (95% CI)	p
Age	0.982 (0.951–1.014)	0.269		
Female sex	1.437 (0.295–7.006)	0.653		
Positive anti-Sm Ab	0.648 (0.243–1.728)	0.386		
Positive anti-Ro Ab	0.928 (0.341–2.529)	0.885		
Positive anti-La Ab	2.075 (0.572–7.528)	0.267		
Positive anti-U1RNP Ab ^a	0.271 (0.085–0.861)	0.027	0.176 (0.040–0.769)	0.021
Positive anti-dsDNA Ab ^a	7.333 (2.574–20.893)	<0.001	11.200 (2.202–56.957)	0.004
Low C3 ^a	9.970 (3.117–31.891)	<0.001	1.886 (0.255–13.932)	0.534
Low C4 ^a	3.839 (1.405–10.486)	0.009	1.224 (0.229–6.552)	0.813
GFR	0.980 (0.964–0.997)	0.021	0.973 (0.951–0.994)	0.013
Urine PCR	1.000 (0.987–1.013)	0.986		
Urine RBC of ≥ 5 /HPF	4.178 (1.516–11.509)	0.006	2.053 (0.426–9.893)	0.370
Urine WBC of ≥ 5 /HPF	2.687 (0.958–7.543)	0.060		
Urine cast	4.429 (0.567–34.578)	0.156		
SLEDAI-2K	1.173 (1.063–1.294)	0.001	1.046 (0.900–1.216)	0.557

Variables with P value less than 0.05 in the univariable analysis were selected for inclusion in the multivariable analysis.

^aAnalyzed as binary variables (Anti-U1RNP Ab, positive/negative; Anti-dsDNA Ab, positive/negative; C3, low/not low; C4, low/not low)

Ab, antibody; anti-dsDNA, anti-double-stranded DNA; GFR, glomerular filtration rate; PCR, protein/creatinine ratio; RBC, red blood cell; HPF, high power field; WBC, white blood cell; SLEDAI-2K, Systemic Lupus Erythematosus Disease Activity Index 2000; OR, odds ratio; CI, confidence interval

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FRI0177 MULTI-MODALITY IMAGING TO EVALUATE LUPUS NEPHRITIS

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Background: Lupus nephritis (LN) remains a significant cause of morbidity and mortality in subjects with Systemic Lupus Erythematosus (SLE). The gold standard for evaluation of LN remains the kidney biopsy, whereas renal function is usually evaluated by eGFR and urinary protein:creatinine ratio. More effective and sensitive methodology is needed to assess LN and also the response to treatment. Functional imaging of the kidney using quantitative techniques has great potential, as it can assess kidney function and pathologic changes non-invasively by evaluating perfusion, oxygenation, cellular density and fibrosis.

Objectives: The objective of this study was to develop a multi-modality imaging approach for the evaluation of the spectrum of pathologic changes in LN and to determine when imaging data correlated with renal function

Methods: In this multi-center study (NCT03180021), subjects who were having a standard of care renal biopsy for LN were asked to participate in the imaging evaluation. Local Institutional Review Board approval was obtained, and subjects signed an Informed Consent Form. Dynamic contrast enhanced MRI (DCE-MRI) was employed to detect changes in vascularization and perfusion, Diffusion Weighted Imaging (DWI) to assess interstitial diffusion, T2*Map/BOLD to evaluate tissue oxygenation and T1rho to evaluate fibrosis (Figure 1). Regions of interest were identified in the imaged kidneys and imaging parameters were correlated with measures of renal function, including eGFR and urinary

protein:creatinine ratio. In DCE-MRI, we specifically focused on mean Maximum Enhancement (ME), mean Time to Peak Enhancement (TTP) and mean Time of Washout (Twashout) as indicators of renal perfusion.

Results: Nine subjects have been evaluated to date and their imaging data assessed for quality. Evaluation of mean data from DCE-MRI has shown a significant correlation between renal perfusion and renal function. For example, as shown in the figure, the 24 hour protein concentration negatively correlated with ME ($r_s = -0.81$, $p=0.015$), TTP ($r_s = -0.83$, $p=0.01$) and Twashout ($r_s = -0.81$, $p=0.01$, Spearman rank correlation). In addition, the protein:creatinine ratio also negatively correlated with ME ($r_s = -0.79$, $p=0.02$), TTP ($r_s = -0.74$, $p=0.04$) and Twashout ($r_s = -0.79$, $p=0.02$, Spearman rank correlation).

Conclusion: These initial results have established the feasibility of multi-modal imaging as a tool to evaluate LN in a multi-center study. Moreover, changes in perfusion detected by DCE-MRI significantly correlate with proteinuria and urinary protein:creatinine ratio. These results suggest that multiparameter imaging may contribute useful data in the evaluation of subjects with LN.

Figure:

Indicators of Renal Perfusion Determined by DCE-MRI Correlate with Measures of Renal Function

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FRI0178

PREDICTIVE FACTORS FOR POOR SLEEP QUALITY IN SYSTEMIC LUPUS ERYTHEMATOSUS

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Background: Poor sleep quality is common in systemic lupus erythematosus (SLE) and could contribute to fatigue, which is regarded as one of the most disabling symptoms in SLE. The Pittsburgh sleep quality index (PSQI) is a validated self-administered questionnaire that measures sleep quality over the previous month.¹

Objectives: The aim of this study was to analyse the relationship of sleep quality with several variables including depression, anxiety, pain, disease activity, fatigue and functional disability in patients with SLE. A further aim was to establish the prevalence of poor sleep quality in SLE.

Methods: A cohort cross-sectional study was carried out including 92 SLE patients who fulfilled the SLICC classification criteria for SLE and who provided informed consent for participation. The patients were interviewed and they were asked to fill in questionnaires including PSQI, Fatigue Severity Scale (FSS), Hospital Anxiety and Depression Scale (HADS), visual analogue scale (VAS) for pain and modified Health Assessment Questionnaire (mHAQ). Blood and urine tests enabled the calculation of SLE disease activity index-2K (SLEDAI-2K). The study was approved by the University Research Ethics Committee.

Results: 92.4% of the cohort studied were females, and the mean age was 46.9 years (range 19-79 years). 55.4% were noted to have poor quality sleep (PSQI >5), and the median PSQI was 6 (range 0-18). Sleep quality measured by PSQI, had a significant correlation with SLEDAI-2K ($R=0.254$, $p=0.014$), VAS pain ($R=0.515$, $p<0.001$), HADS-D ($R=0.605$, $p<0.001$), HADS-A ($R=0.375$, $p<0.001$), estimated glomerular filtration rate (eGFR) ($R=-0.211$, $p=0.044$), FSS ($R=0.551$, $p<0.001$) and mHAQ ($R=0.559$, $p<0.001$). ANCOVA analysis showed that PSQI

was significantly dependant on VAS pain ($p<0.001$), HADS-D ($p<0.001$) and eGFR ($p=0.003$).

Conclusion: Poor sleep quality is highly prevalent in SLE patients. This study has shown that the strongest predictive factors for poor sleep quality are pain, depression and impaired renal function. Since poor sleep quality is significantly related to fatigue and functional disability, its identification and management is important for patients' wellbeing.

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FRI0179

A STUDY ON THE ACHIEVEMENT OF LUPUS LOW DISEASE ACTIVITY STATE AND QUALITY OF LIFE IN PATIENTS WITH SYSTEMIC LUPUS ERYTHEMATOSUS: FROM THE JUNTENDO UNIVERSITY SLE PROSPECTIVE REGISTRY STUDY

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Background: Systemic lupus erythematosus (SLE) is a chronic autoimmune disease of unknown etiology that affects mostly young women. Multiorgan complications and prolonged treatment significantly cause physical and mental stress in patients. Improving patients' quality of life (QOL) in SLE treatment is essential. We examined the treatment effects on disease activity and QOL of SLE patients.

Objectives: In recent years, lupus low disease activity state (LLDAS) has been proposed as a treatment target for SLE. Patients who achieve LLDAS have a low recurrence rate for lupus and a low risk of serious complications (1). The aim of this study is to investigate whether achieving LLDAS reduces not only recurrence rate and complications of SLE but also improves patients' QOL.

Methods: A total of 104 SLE patients were enrolled in our prospective SLE registry study (Juntendo, Multi-center, Prospective cohort for investigation of clinical course and outcome in SLE: JUMP) conducted at our institution. SLE was diagnosed using the American College of Rheumatology (ACR) 1982 criteria (revised in 1997). QOL was evaluated using the standard version of the 36-item short form health survey version 2 (SF36v2). Participants were divided into the LLDAS achievement and non-achievement groups, and the characteristics of each group including results of SF36v2 were examined.

Results: This study included 104 SLE patients, 94 female and 10 male, and the average age and disease duration were 46.4 ± 13.8 and 14.5 ± 11.3 years, respectively. The average corticosteroid dose was 8.0 ± 17.4 mg/day in terms of prednisolone, and anti-dsDNA antibody titer was 16.8 ± 38.5 IU/ml. Of the 104 patients, 57 achieved LLDAS. The subscale's standard scoring using SF36v2 for role physical (RP) was 78.9 ± 24.0 and 64.6 ± 27.6 ($P<0.01$), general health (GH) was 50.0 ± 17.0 and 42.0 ± 19.3 ($P<0.05$), vitality (VT) was 55.8 ± 15.8 and 38.0 ± 24.1 ($P<0.01$), social functioning (SF) was 82.0 ± 20.7 and 66.5 ± 26.3 ($P<0.01$), role emotional (RE) was 89.0 ± 16.1 and 73.4 ± 28.1 ($P<0.01$), and mental health (MH) was 72.4 ± 15.9 and 58.3 ± 21.8 ($P<0.01$) in the LLDAS achievement and non-achievement groups, respectively. Furthermore, scoring based on the national standard value in the LLDAS achievement group showed that two categories were >50. However, in the LLDAS non-achievement group, all categories were <50. In particular, RP, GH, VT, SF, RE, and MH of the LLDAS achievement group had significantly higher scores than the LLDAS non-achievement group (RP and GH: $p<0.05$ and VT, SF, RE and MH: $p<0.01$).

Conclusion: Results of examining the association between LLDAS and QOL using SF36v2 in SLE patients showed that patients who achieved LLDAS had significantly better standard statistical scores in many subscale categories. Thus, LLDAS achievement as a treatment target for SLE patients greatly contributes to improving patients' QOL.

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