Baseline Nailfold Videocapillaroscopy and Its Prognostic Value in Pulmonary Decline and Disease Progression in Systemic Sclerosis

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Background

- Systemic sclerosis (SSc) is a complex connective tissue disease often complicated by interstitial lung disease (ILD), which contributes significantly to morbidity and mortality. **Krebs von den Lungen-6 (KL-6) has been identified as a potential biomarker for ILD severity. Nailfold videocapillaroscopy (NVC) is a non-invasive tool to detect microvascular changes in SSc, but its role in predicting ILD progression and outcomes requires further investigation**. This study aimed to assess whether baseline NVC findings in SSc patients could **predict pulmonary function decline and changes in serum biomarkers, inflammatory markers, disease activity indices (EUSTAR 2017, SCTC-DI), and other clinical parameters over a two-year follow-up.**

Methods

- This prospective longitudinal study included SSc patients diagnosed according to the 2013 ACR/EULAR criteria, stratified by the presence of ILD. **Baseline assessments included NVC, chest high-resolution computed tomography (HRCT), pulmonary function tests (PFTs), and serum biomarker measurements (KL-6, IL-18, IL-18BP) using quantitative ELISA**. The annualized rate of change in forced vital capacity (FVC) was calculated as a surrogate for ILD progression. Associations between baseline NVC patterns and longitudinal changes in %DLCO, %FVC, biomarkers, inflammatory markers, and disease indices were analyzed using correlation and multivariate regression modeling.

Results

- **74 patients** (27% male, mean age 57.5 ± 15 years) were included, with a **mean disease duration of 7.67 ± 8 years**. At baseline, 38% had ILD, which increased to 51% after two years, while the proportion with ≥20% lung involvement on HRCT rose from 32% to 43%.
- **Disorganization of capillary architecture** at baseline predicted faster declines in %FVC (β = -0.75, p = 0.03) and %DLCO (β = -0.24, p = 0.03), as well as worsening modified Rodnan skin score (mRSS) (β = 0.23, p = 0.03) at two-year follow-up.
- **A late NVC pattern** was associated with worsened mRSS (β = 0.47, p = 0.004), larger increases in KL-6 (β = 0.18, p = 0.04), and a more rapid decline in %DLCO (β = -0.38, p = 0.04). A **higher baseline SCTC-DI score** predicted progression of semiquantitative fibrosis on HRCT (β = -0.32, p = 0.003) and elevated CRP levels (β = 0.38, p = 0.003) at two years.

Conclusions

- **Capillary disorganization and late NVC patterns at baseline** predict faster declines in pulmonary function, increased serum KL-6 levels, and worsening skin fibrosis over two years in SSc patients. Additionally, **higher baseline SCTC-DI scores** at baseline are associated with fibrosis progression on HRCT and elevated CRP levels.

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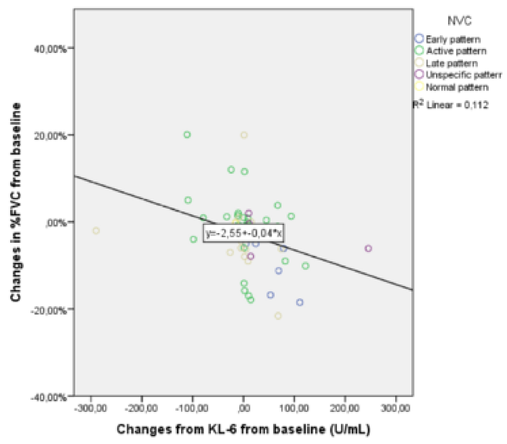
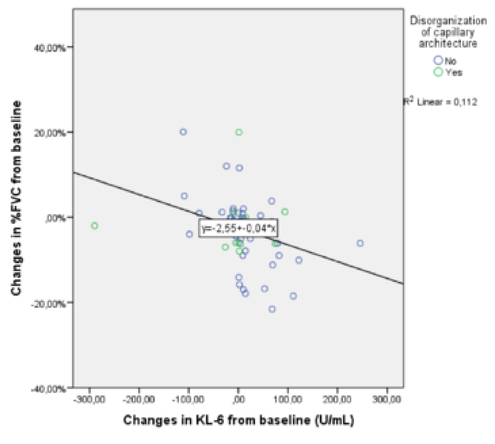
NVC scleroderma spectrum abnormalities, %	SSc-ILD (N=28)	SSc (N=46)	P value
Early pattern	1 (4%)	8 (17%)	0.11
Active pattern	11 (39%)	24 (52%)	0.28
Late pattern	15 (43%)	10 (22%)	0.006
Loss of capillary density	16 (57%)	10 (22%)	0.002
Avascular areas	11 (39%)	11 (24%)	0.16
Enlarged and giant capillaries	17 (61%)	33 (72%)	0.33
Tortuous capillaries	13 (46%)	35 (76%)	0.01
Haemorrhages	23 (82%)	20 (44%)	0.002
Disorganization of capillary architecture	7 (25%)	11 (24%)	0.02

Table 1: Nailfold Videocapillaroscopy Abnormalities in SSc Patients With and Without Interstitial Lung Disease



Graph 1: Relationship between changes in KL-6 Levels and %FVC decline across NVC patterns in SSc Patients.



Graph 2: Association Between Changes in KL-6 Levels and %FVC Decline in SSc Patients, Stratified by Capillary Disorganization.