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## INTRODUCTION

The aim of this study was to **identify changes in voice as the disease progresses** and **explore possible associations with motor and respiratory parameters**.

## METHODS

**5 spinal ALS patients** were enrolled, including 2 with a pure flail-arm phenotype (40%) and 3 with a mixed phenotype (characterized by both UMN and LMN at four limbs) (60%). Evaluations were performed at enrollment (T0) and after 3 months (T1). At each time point, the following parameters of eloquence were analyzed through PRAAT software: **Shimmer%** (normal value below 3.81%) and **Jitter%** (normal value below 1.04%), both of which indicate the voice quality, and Maximum Phonation Time [**MPT**] (normal value above 10 seconds). Patients also underwent motor (**ALSFRS-R**, **upper limbs MRC**, Barthel Index [**BI**]), quality of life (Quality of Life in the Dysarthric Speaker [**QOL-DYS**], the 40-item ALS Assessment Questionnaire [**ALSAQ-40**], McGill Quality of Life questionnaire [**MQOL**]) and respiratory (**FVC%**) assessments. Findings from T0 to T1 were processed and analyzed descriptively.



## RESULTS

The **overall results** mean value obtained from the vocal analysis of the 5 patients with ALS are as follows: at **T0**, alterations were observed in Jitter (1.06%) and Shimmer (15.91%) parameters, not in MPT (11.19 sec); at **T1**, also MPT was found to be altered (9.23 sec), like the other parameters (Jitter 1.16%, Shimmer 14.35%).

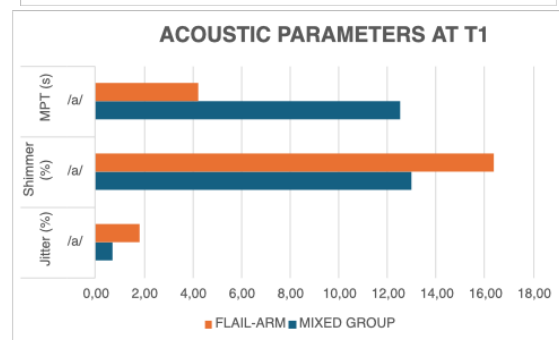
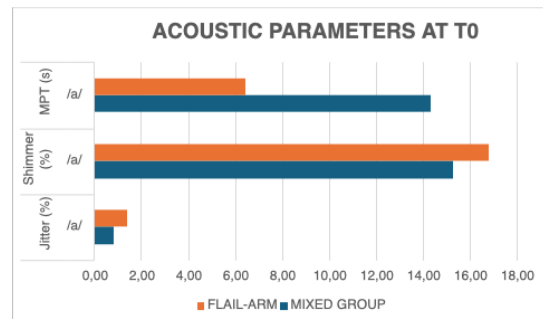
The analysis of the results obtained from the 2 groups (**flail-arm phenotype vs mixed group**) was then carried out.

At **T0**, the means of the acoustic parameters were more altered in the flail-arm than in the mixed group (Shimmer 16.84% vs 15.29%; Jitter 1.39% vs 0.85%; MPT 6.44 sec vs 14.36 sec). At T0, the flail-arm group showed worse motor function and global autonomy (mean MRC 2.57 vs 3.42; mean ALSFRS-R 27.5 vs 28.3; mean BI 52.5 vs 58.33) but a better respiratory function (mean FVC 81.5% vs 73%) compared to the mixed group.

At **T1**, the vocal parameters remained almost unchanged or worsened in the flail-arm group (Shimmer 16.38%; Jitter 1.84%; MPT 4.26 sec); in the mixed group, Shimmer and Jitter apparently improved (13.00% and 0.71%, respectively), while MPT worsened (12.55 sec). Respiratory function was confirmed to be better in the flail arm group at follow-up (FVC 76% vs 74.7% in the mixed group).

OVERALL RESULTS MEAN VALUES

TIMEPONT	T0	T1
MPT [sec]	11.19	<b>9.23</b>
SHIMMER %	<b>15.91</b>	<b>14.35</b>
JITTER %	<b>1.06</b>	<b>1.16</b>



## CONCLUSIONS

This preliminary study shows disease-related vocal abnormalities with specific characteristics according to the phenotype and apparently independent of respiratory function. Larger and prospective studies are needed to clarify voice changes in ALS patients over time.

