

RECOVERY OF LINGUISTIC DEFICITS IN STROKE PATIENTS; A THREE-YEAR-FOLLOW UP STUDY.

Introduction

For the diagnosis of aphasia early after stroke, several screening tests are available to support clinical judgment (FAST, Enderby 1987; AASP, Crary et al. 1989; UAS, Thomessen et al. 1999). None of these tests enables the clinician to assess the underlying linguistic deficits, i.e. semantic, phonological and syntactic deficits, which provides indispensable information for early therapeutic decisions. The cognitive linguistic approach – directed to the linguistic level deficit – is recommended as a ‘practice standard’ (Cicerone et al. 2000) and the data of a meta-analysis show that the largest effect of treatment is reached in the acute stage after onset (within 3 months) (Robey 1994, 1998). The ScreeLing was designed as a screening test to detect semantic, phonological and syntactic deficits and appeared to be an accurate test for the detection of aphasia between 2 and 11 days after stroke (0.92), with a sensitivity of 86% and specificity of 96% (Doesborgh et al. 2003). Selective linguistic disorders were already present in the first week post onset in five out of 17 patients (29%). This is important for guiding early aphasia therapy, the importance of which is increasingly recognized. Treatment is assumed to influence reorganizational processes in the brain during recovery; the interaction of treatment with spontaneous recovery is thought to be crucial (Code 2001). Studies about the recovery pattern in general agree that the majority of spontaneous recovery occurs during the first three months (e.g. Pedersen et al. 1995) with the greatest amount of improvement in the first two weeks post-onset (Hartman 1981). The initial severity of the language impairment is reported to be the only crucial factor for final language function (Pedersen et al. 1995). No data are available about the recovery pattern of the different linguistic levels. Knowledge of the degree of recovery of each linguistic deficit will affect early therapeutic decisions with respect to which linguistic deficit should be treated and when. In a follow-up study, we investigated the degree of recovery of linguistic deficits from the acute phase of aphasia until three years post onset and the predictors of the final outcome.

Subjects

Aphasic patients (n= 20). Mean age 67 (sd 11.74), Infarction: n=7, Hemorrhage: n=13.

Methods

Measures, applied during recovery

- (i) a semi-standardized interview, evaluated according to the Aphasia Severity Rating Scale (Goodglass and Kaplan 1972).
- (ii) Token Test, 36 item version (De Renzi and Faglioni 1978), cut-off score: <29.
- (iii) ScreeLing, each linguistic level consists of 24 items divided into four subtests. Optimal cut-off score total ScreeLing: <65, optimal cut-off score semantics < 18, phonology < 20, syntax < 13.

Time of investigation

Time I: 2-4 days p.o.

Time II: 9-12 days p.o.

Time III: 2 months p.o.

Time IV: 3 months p.o.

Time V: 6 months p.o.

Time VI: 3 years p.o.

Results:

Fourteen participants were assessed for this study. Four patients died. One patient did not want to participate in the follow up study and one patient was untraceable.

Changes in *total ScreeLing* scores indicated significant improvement only between Time I and Time II ($t = -2.41$, $df = 11$; $p = .035$) and between Time II and Time III ($t = -4.24$, $df = 11$; $p = .001$).

However, it appeared that the effect size for the total difference in ScreeLing score between Time I and Time II was negligible (Cohen's $d = 0.14$), the effect size between the difference in scores between Time II and Time III was large (Cohen's $d = 0.87$). Consequently, only the improvement from 10 days to 2 months post-onset is clinically relevant.

The results of the paired t-tests conducted for the three levels of the ScreeLing showed a significant improvement between Time II and Time III in *semantics* ($t = -4.79$, $df = 12$; $p = .000$), *phonology* ($t = -2.33$, $df = 11$; $p = .040$), and *syntax* ($t = -4.08$, $df = 12$; $p = .002$). Only in syntax significant improvement was also found between Time I and Time II ($t = -3.19$, $df = 11$; $p = .009$).

None of the linguistic levels showed significant improvements further in time.

Improvement of the *Aphasia Severity Rating Scale* was found from Time II to Time III: $t = -2.28$, $df = 13$; $p = .040$, Time III to Time IV: $t = -2.65$, $df = 14$; $p = .019$, Time IV to Time V: $t = -3.21$, $df = 12$; $p = .008$.

In the *Token Test* the paired t-tests showed significant improvement from Time I to Time II: $t = -2.59$, $df = 8$; $p = .032$ and from Time II to Time III: $t = -3.52$, $df = 8$; $p = .008$). No significant changes occurred after 2 months.

A linear regression analysis showed that the test results at Time III (2 months p.o.) were extremely good predictors of the test results at 3 years post-onset, except for semantics (see table 1). The three tests accounted each for more than 59% of the variance.

Insert table 1

Discussion and conclusion

The results of the study indicate that improvement on the linguistic levels occurred only up to the first 2 months post-onset, just as the improvement on the Token Test, a measure for the severity of aphasia, which also reached a plateau at two months post onset. However, our data do not confirm that the greatest amount of improvement takes place in the first two weeks post onset. Improvement in the first two weeks is only shown by the subtest Syntax and the Token Test and less than in the second period of observation: between Time II and Time III. The greatest improvement on all measures occurs between Time II, 9-12 days post onset, and Time III, 2 months post onset. The acute stage during which natural restoration of neural circuits occurs, is mentioned as an optimal condition for treatment aimed at restoration of cognitive linguistic functions: treatment is assumed to influence reorganizational processes in the brain during recovery. The effect of treatment in the acute stage is reported to be twice as large as the effect of spontaneous recovery alone. The data of our study suggest that intense therapy over a short amount of time, between two weeks and two months post onset, is crucial for the interaction between treatment on the various linguistic levels and neural recovery.

Finally, the results indicate that not the initial severity of the linguistic disorders is crucial for the final outcome at 3 years post onset, but the severity at 2 months post onset, when the linguistic deficits became stable. It remains an open question whether an intensive linguistic therapy given from 2 weeks to 2 months post onset will result in an improvement of the final outcome. The value of our observations in this pilot study will be considered in an investigation of a larger group of patients.

References

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Table 1: Prediction of the test scores at 2 months p.o. for the final outcome at 3 years p.o.

	B	SEB	β	Adjusted R²	F (df)	Significance
Aphasia Severity Rating Scale	.929	.147	.877	.749	39.80 (1,12)	.000
Semantics	.367	.303	.358	.041	1.47 (1,10)	.254
Phonology	.934	.107	.941	.873	76.79 (1,10)	.000
Syntax	.813	.189	.792	.593	18.50 (1,11)	.001
ScreeLing total	.793	.184	.807	.616	18.62 (1,10)	.002
Token Test	.842	.093	.944	.881	82.58 (1,10)	.000