

Speech and language therapy for aphasia following subacute stroke

Engin Koyuncu^{1,*}, Pınar Çam¹, Nermin Altınok², Duygu Ekinci Çallı², Tuba Yarbay Duman³, Neşe Özgirgin¹

1 Department of Physical Medicine and Rehabilitation, Ankara Physical Medicine and Rehabilitation Training and Research Hospital, Ankara, Turkey
2 Department of Psychology, Ankara Physical Medicine and Rehabilitation Training and Research Hospital, Ankara, Turkey
3 Department of Linguistics, Amsterdam Center for Language and Communication, Amsterdam Brain and Cognition Center, University of Amsterdam, Amsterdam, The Netherlands

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Abstract

The aim of this study was to investigate the time window, duration and intensity of optimal speech and language therapy applied to aphasic patients with subacute stroke in our hospital. The study consisted of 33 patients being hospitalized for stroke rehabilitation in our hospital with first stroke but without previous history of speech and language therapy. Sixteen sessions of impairment-based speech and language therapy were applied to the patients, 30–60 minutes per day, 2 days a week, for 8 successive weeks. Aphasia assessment in stroke patients was performed with Gülhane Aphasia Test-2 before and after treatment. Compared with before treatment, fluency of speech, listening comprehension, reading comprehension, oral motor evaluation, automatic speech, repetition and naming were improved after treatment. This suggests that 16 sessions of speech and language therapy, 30–60 minutes per day, 2 days a week, for 8 successive weeks, are effective in the treatment of aphasic patients with subacute stroke.

Key Words: nerve regeneration; stroke; aphasia; speech and language therapy; disability; rehabilitation; Gülhane Aphasia Test-2; neural regeneration

Introduction

Stroke is the second most common cause of death and third most common cause of disability in the world (Mathers et al., 2009; Boller et al., 2015). Stroke is also a leading cause of aphasia with acquired neurogenic language disorder. Aphasia was reported to develop in one-third of patients with stroke (Brady et al., 2012) and in two-thirds of patients with right hemiplegia due to stroke (Fama et al., 2014). This condition leads to disruption of communication, decreased social activity, depression, low job possibility, severe disability, and impairment of quality of life (Flamand-Roze et al., 2011).

The majority of patients with aphasia go through a period of spontaneous recovery following stroke in which they regain some of their language function. This recovery occurs most rapidly in the first 2 weeks in ischemic stroke whereas it is observed later *i.e.*, in the first 4–8 weeks in hemorrhagic stroke (Sinanović et al., 2011). Although spontaneous recovery is predominantly complete in the first 12 months, it may also continue after 12 months (Fama et al., 2014). However, a complete recovery is often unlikely: aphasia was reported to continue in 43% of patients at 18 months (Laska et al., 2001) and in 10–38% of patients at long-term follow-ups (Lee et al., 2015). Therefore, therapy must be performed for aphasia in patients with stroke. Speech and language therapy (SLT) (Brady et al., 2012), medical therapy (Berthier et al., 2011), transcranial direct current stimulation (Elsner et al., 2015) and recurrent low frequency transcranial magnetic stimula-

tion (Li et al., 2015) are common currently used methods for aphasia treatment.

The efficacy of SLT applied in aphasia treatment has been reported in a Cochrane analysis (Brady et al., 2012). Nevertheless, both the time when SLT should start (Moss et al., 2006; Allen et al., 2012; Nouwens et al., 2015) and the duration and intensity (Dignam et al., 2015a) of this therapy are still controversial. Moreover, there are several different SLT methods applied in aphasia treatment like stimulation, pragmatic, neurolinguistic, syndromic, cognitive-linguistic, functional, conventional, impairment based, constraint-induced, verb comprehension, computer-mediated, semantic, social or outcome-based approaches (Brady et al., 2012; Basso et al., 2013).

In this study, we investigated the outcomes of impairment-based SLT performed 30–60 minutes per day, 2 days a week for 8 weeks in the treatment of aphasic patients with subacute stroke, with the aim of obtaining the time window, duration and intensity of the optimal SLT intervention.

Subjects and Methods

Patients

All patients or patient's relatives were informed about the study and each signed a written informed consent form before the study. The study was approved by Ankara Physical Therapy and Rehabilitation Training and Research Hospital Education Planning Committee (approval No. 17.04.2015/1678).

*Correspondence to:
Engin Koyuncu, M.D.,
engkoyuncu@gmail.com.

orcid:
0000-0001-5512-2396
(Engin Koyuncu)

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Table 1 Demographic and clinical characteristics of included patients

Age (year)	57.2±11.4, 57(39–85)
Sex [female/male, n(%)]	11(33.3)/22(66.7)
Disease duration (day)	105.5±79.3, 83(25–352)
Stroke etiology [thromboembolic/hemorrhagic, n (%)]	25(75.8)/8(24.2)
Level of education (year)	6.6±3.8, 5(0–15)

Age, disease duration, and level of education are expressed as the mean ± SD, median (min–max). *n* = 33.

A total of 33 subacute stroke patients participated in the study. All the patients were hospitalized in 2015 for stroke rehabilitation in Ankara Physical Therapy and Rehabilitation Training and Research Hospital, Turkey. They were consulted for Neurogenic Language and Speech Rehabilitation Unit due to aphasia. Written records of age, sex, stroke etiology and education duration of patients were available at the unit. Patients were selected against inclusion and exclusion criteria. Patients meeting all of the criteria were included: (1) have a first stroke (*i.e.*, no history of a prior stroke), (2) have this stroke in sub-acute term, (3) have no prior history of SLT. Patients presenting with one or more of the following conditions were excluded (1) neurologic diseases apart from stroke, (2) bilateral stroke, and (3) dementia and psychiatric disorder.

Demographic and clinical characteristics of the patients are presented in **Table 1**.

Evaluation of aphasia

For the purpose of aphasia assessment in patients with sub-acute stroke, Gülhane Aphasia Test-2 (GAT-2) was used. The validity and reliability study of GAT-2 was performed by Maviş et al. (2007). The assessment of aphasia with GAT-2 was performed before and after 16-session SLT.

Evaluations and treatments have been performed by two certified SLTs/psychologists. GAT-2 consists of 7 sections, including fluency of speech, listening comprehension, reading comprehension, oral-motor evaluation, automatic speech, repetition, and naming (**Table 2**).

Total scores of GAT-2 (82 points) are divided into two components as “language score” (*i.e.*, total scores of all the subtests except for oral-motor evaluation) and “motor score” (*i.e.*, the scores of the subtest oral-motor evaluation). While “language score” (69 points) provides information as to language ability, “motor score” (13 points) provides information about motor speech problems. In this study, the patients were classified as having severe (0–28 points), moderate (29–55 points) or mild (56–69 points) aphasia based on their “language score”.

Intervention

In total, 16-session impairment-based SLT (30–60 minutes per day, 2 days a week, for 8 successive weeks) was applied to the patients. This approach was used to improve language functions by giving direct stimulants to the patients in the areas covering understanding-listening, speaking, reading, and writing. According to patients’ affected language areas, requirements and desire, the ordering exercises, phonetic speech, semantic speech or naming by giving nominal clue exercises, picture/object/essay matching, alignment, the exercises locating different/similar/deficient/excess ones,

Table 2 Gülhane Aphasia Test-2 (GAT-2) aphasia scoring

	Point
A. Fluency of speech	5
B. Comprehension	
Listening comprehension	
1. Comprehension of simple command	9
2. Yes/No questions	5
Reading comprehension	
1. Matching	6
2. Reading written instruction	9
3. Voice reading	7
C. Oral-motor evaluation	
1. Evaluation of non-verbal skills	9
2. Evaluation of verbal skills	4
D. Automatic speech	4
E. Repetition	14
F. Naming	
1. Picture naming	5
2. Responder naming	5
Total point	82

sentence completion, story building, writing, calculation, reading, reading comprehension, iteration (word or sentence repetition) exercises were performed to improve auditory perception and discrimination. The individualized programs were performed corresponding to the affected language area of the patients according to their needs and desire. The programs performed in patients with mild and severe aphasia were different from each other. SLT was also differentiated according to the improvement in patient’s aphasia level. Furthermore, the caregiver training and homeworks provided support for patient’s developmental process.

Statistical analysis

Statistical analyses were performed using SPSS 15.0 software (SPSS, Chicago, IL, USA). The Shapiro-Wilk test was used to determine whether the continuous variable distribution was normal. Descriptive statistics were provided as the mean ± standard deviation or median (min–max) for continuous variables while the number of cases and percentages were used for nominal variables. Due to the detection of non-normal distribution in overall GAT-2 scores and its sections, the scores before and after the therapy was compared using Wilcoxon test. A *P* value < 0.05 was considered statistically significant.

Results

The fluency of speech (*P* = 0.000), listening comprehension (*P* = 0.000), reading comprehension (*P* = 0.000), oral-motor evaluation (*P* = 0.000), automatic speech (*P* = 0.001), repetition (*P* = 0.000) and naming (*P* = 0.000) scores and total scores (*P* = 0.000) were significantly improved after treatment compared with before treatment (**Table 3**). The patients in this study were divided into three groups according to the aphasia severity as severe, moderate and mild based on their initial “language score” on GAT-2. After treatment, a statistically significant increase was detected in total language scores for severe and moderate aphasia groups compared with their pre-treatment level (*P* = 0.000 and 0.005, respectively) (**Table 4**).

Table 3 Scores of Güllhane Aphasia Test-2 (GAT-2) and its subdivisions before and after speech and language therapy

GAT-2 and its subdivisions (min-max)	Pre-treatment [mean ± SD, median (min-max)]	Post-treatment [mean ± SD, median (min-max)]	P*
Fluency of speech (0-5)	1.7±1.8, 1(0-5)	3.1±1.9, 4(0-5)	0.000
Listening comprehension (0-14)	6.5±4.2, 6(0-14)	10.7±3.5, 12(1-14)	0.000
Reading comprehension (0-22)	5.7±6.4, 4(0-22)	10.2±7.3, 8(0-22)	0.000
Oral-motor evaluation (0-13)	7.2±4, 8(0-13)	10.7±2.6, 11(2-13)	0.000
Automatic speech (0-4)	1.3±1.6, 0(0-4)	2.4±1.8, 2(0-4)	0.001
Repetition (0-14)	4.7±4.7, 3(0-14)	7.7±5.1, 8(0-14)	0.000
Naming (0-10)	2.1±2.9, 0(0-10)	4.6±3.9, 5(0-10)	0.000
GAT-2 total score (0-82)	28.8±22, 26(1-76)	48.5±23, 51(5-80)	0.000

*Wilcoxon Test. *n* = 33.**Table 4 Güllhane Aphasia Test-2 (GAT-2) language scores before and after speech and language therapy**

Aphasia severity according to the GAT-2 language score	<i>n</i>	Pre-treatment [mean ± SD, median (min-max)]	Post-treatment [mean ± SD, median (min-max)]	P*
Severe (score 0-28)	21	9.5±8.2, 8(0-24)	25.9±15.4, 24(2-60)	0.000
Moderate (score 29-55)	10	38.6±5, 39.5(30-47)	57.3±8.6, 59.5(43-67)	0.005
Mild (score 56-69)	2	63.5±0.7, 63.5(63-64)	66.5±0.7, 66.5(66-67)	0.157

*Wilcoxon Test. *n* = 33.

Discussion

Our results demonstrated that SLT we applied to aphasic patients with subacute stroke was an effective treatment method. The efficacy of treatment was shown in patients with moderate to severe aphasia. There are several limitations to this study. First, there was no non-treated control group in this study because of hospital regulations stating that all stroke patients enrolled at the hospital should receive SLT. Second, the patients participated in this study were selected from those who were newly enrolled at the hospital. Third, no comparisons were made between treated and non-treated groups or between treatments with varied durations (*i.e.* shorter *vs.* longer) or intensities (*i.e.*, higher *vs.* lower). Fourth, this study involved 33 patients with subacute stroke, which might be a relatively small sample size for an intervention study. However, the use of a well-defined patient inclusion and exclusion criteria helped forming a homogenous group of patients and the results of the study were clear-cut. In our study, impairment-based therapy approach was applied, the aim of which was to improve functional communication by targeting the impaired brain region responsible for language function. In a Cochrane review, Brady et al. (2012) investigated the impact of various SLT methods used in stroke-related aphasia (group, individual, intensive, conventional, semantic, fonologic, cognitive-linguistic, communicative, functional, constraint-induced, computer-mediated) on functional communication improvement in this population. The results showed that each SLT method examined contributed similarly to the functional communication outcomes. That is, none of the SLT methods was more effective than the other in terms of improving functional communication. Results from their Cochrane review showed that there was no sound evidence to claim that one SLT method was more effective than the other, although the authors suggested that group therapy and therapist-delivered therapy were more effective than individual therapy and computer-mediated therapy, respectively (Brady et al., 2016).

The question when aphasia rehabilitation after stroke

should start remains controversial. In a randomized, controlled study performed by Laska et al. (2011) in 123 very early phase (2-4 days) stroke patients, 21-session SLT was applied for 45 minutes a day and 7 days a week. The patients were evaluated in the 3rd week and the 6th month. Their results demonstrated that an intensive SLT starting in the very early phase is not effective in aphasia treatment. In a study conducted by Bowen et al. (2012) in 170 patients with early phase (< 4 months) aphasia due to stroke and dysarthria, 85 patients underwent impairment-based SLT according to patient's needs (mostly 3 days a week for 16 successive weeks) and the remaining 85 patients served as controls who underwent only social communication. The time window, intensity and duration of SLT were determined according to the clinical condition of the patient. At the 6-month evaluation, no significant differences were found between primary and secondary evaluation scales. Godecke et al. (2014) also performed a study in 47 patients with early-phase stroke and aphasia, in which the study population was divided into two groups as patient (*n* = 20) and control (*n* = 27) groups. Twenty sessions of impairment-based SLT, 1 hour per day, was applied to the patient group. A significant improvement was detected in the patient group compared to the control group just after treatment as well as at 6-month evaluations. A previous study demonstrated that starting SLT at about the 2nd day after stroke attack was effective and this early intervention had positive effects in the chronic phase as well (Mattioli et al., 2014). There is evidence that it is more effective to start rehabilitation in the very early phase (within average 3 days) after stroke than later (Godecke et al., 2012). Fundamental evidence was not sufficient to declare that an early started aphasia rehabilitation was more effective than the later one (Nouwens et al., 2015). There is evidence that application of aphasia rehabilitation in the chronic phase (> 6 months) is also effective (Allen et al., 2012) and the time at which treatment starts in patients with more than 1 year of stroke does not affect the treatment result (Moss et al., 2006). In this study, we assessed the effectivity of SLT applied to patients with subacute stroke

and concluded that SLT was effective in these patients.

SLT has been reported to be effective in the treatment of aphasia, but the optimal duration and intensity remain controversial (Dignam et al., 2015a). Although aphasia therapy 1–5 hours per week was used in the developed countries, the duration 9 hours per week was reported for an effective treatment (Code et al., 2011). Robey et al. (1998) reported that SLT therapy performed for more than 2 hours per week was more effective than a shorter duration therapy. According to the results of a review paper by Bhogal et al. (2003), an intense weekly therapy program was more effective than a less intense weekly therapy program and SLT performed 8.8 hours per week for 11.2 weeks was found to be the most effective therapy. However, Dignam et al. (2015b) found that SLT applied 6 hours per week for 8 weeks was more effective than the therapy applied 16 hours per week for 3 weeks. Some scholars reported that an intensive therapy was more effective than a standard therapy (Cherney et al., 2008) and they also reported similar outcomes from intensive and non-intensive therapy (Cherney et al., 2011). Bakheit et al. (2007) found that there was no significant difference in aphasia improvement between a standard therapy (2 hours per week for 3 months) and an intensive therapy (5 hours per week for 3 months). In this study, SLT, usually 2 days per week and 30–60 minutes per day for 8 weeks, was applied for stroke-related aphasia treatment, although the exact duration and intensity may sometimes differ based on the clinical condition of a patient. Results showed that SLT applied at this intensity and duration was effective. A more intensive therapy has been shown to be more effective in some studies, but similar efficacy from intensive, non-intensive, or standard therapies was also reported. The proportion of drop-outs was higher in highly intensive SLT than in less intensive program, suggesting that highly intensive SLT program is likely not to be suitable for every aphasia patient (Brady et al., 2016). According to our findings, 16 sessions of SLT, 2 days per week and 30–60 minutes per day, is an effective method in the treatment of patients with subacute stroke presenting with moderate to severe aphasia.

Declaration of patient consent: *The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.*

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