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REVIEW ARTICLE

The clinical management and rehabilitation of post stroke aphasia in Italy: evidences from the literature and clinical experience

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Abstract
Aphasia is one of the most devastating symptoms in stroke survivors and severely affects patients' communication, quality of life, and social interactions. Several factors are critical to the prediction of aphasia recovery, including acute stroke management and subsequent language rehabilitation. A comprehensive assessment of language skills with appropriate instruments in different phases of post stroke months and years is needed in patients, in order to monitor their language improvement and to guide speech therapies over time. Beyond spontaneous recovery, the effects of speech and language therapy in terms of time and dosage of administration during the course of post stroke aphasia are still under investigation. Data point to its efficacy either in the early or in the chronic (> 6 months) post stroke phase, with greater effects if intensive treatments are provided. Tailored interventions for single patients' aphasia characteristics are recommended, with different levels of evidence for specific techniques. Ongoing trials and meta-analyses will be useful in order to change the allocation of rehabilitation resources for patients with aphasia.

Keywords Post stroke aphasia · Language therapy · Rehabilitation

Introduction

Aphasia is a disorder of speaking, comprehension, reading, and writing resulting from damage to brain areas involved in language processing, typically located in the left hemisphere [1].

All levels of language processing (phonological, morphological, lexical-semantic, syntactic, pragmatic) may be interested at different degrees [2, 3] and other neurological symptoms, such as dysarthria, apraxia, hemiparesis, hemianopia, or dysphagia, may coexist in stroke patients.

Stroke is the most common cause of aphasia (in Europe 1 million of new cases per year), followed by head trauma and brain tumors. Other causes include inflammatory, infectious, toxic, metabolic, and degenerative diseases.

Stroke incidence in Italy ranges from 1.8/1.000 to 4.5/1.000 new cases per year, with a prevalence of 6.5/100, similarly to other high-income countries [4]. Incidence of stroke increases with age and is higher in men than in women (mean age at onset 75 years in men and 76.6 years in women), with a peak of incidence in subjects older than 85 [5–7]. About 40% of all people who experience a stroke develop aphasia, more frequently in case of a cardioembolic stroke and more frequently if thrombolysis is performed [8]. Variation in the severity of expressive impairments may range from mild cases, with occasional difficulties in word-finding to total loss of oral output. The severity of aphasia can also change over time and single aspects of language impairment may improve, while others remain impaired.

A similar number of fluent and non-fluent types of aphasia are reported in acute cases ($\leq$ 4–6 weeks post stroke) and a higher number of fluent aphasias in chronic cases ($\geq$ 1 year) [9].

The impact of aphasia on functional communication, everyday activities, and social abilities of patients and of their families is however dramatic and highlights the importance of its effective management and rehabilitation.

In the present paper the main clinical aspects of managing patients with post stroke aphasia will be addressed, basing on the recommendations of the current literature and on the clinical experience as a behavioral neurologist working in a neuropsychology unit of a public hospital of North Italy, dedicated to evaluation and rehabilitation—among others—of post stroke aphasic patients.

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Evolution of post stroke aphasia: spontaneous and language therapy induced recovery

The evolution of post stroke aphasia is both a consequence of spontaneous recovery and of the effects of language rehabilitation, each factor interacting in the single patient at different extent at different time points [10, 11]. After 3 months post stroke, the persistence of aphasia and dysarthria is reported in about one third of patients [12]; however, evidence suggests that language improvement may continue up to the first year and beyond, even though it is not clear the length of time it may be expected to continue [13, 14].

Early recovery is likely to be due to restoration of blood flow and other mechanisms of tissue recovery, while later stages of recovery are likely to depend on the reorganization of brain structure/function, as well as to compensatory mechanisms [15, 16]. Neural mechanisms underlying aphasia improvement have been studied by many authors, mainly using functional MRI. Albeit different methodological aspects between the studies (experimental design, language task examined, lesion extent and location, time post stroke), some neuroimaging patterns have emerged: in recovery of speech production, a slowly increasing activation in the left hemisphere frontotemporal cortex has been reported, a right inferior frontal gyrus change in activation has been identified (although what this represents is still hotly contested), and a bilateral temporal lobe activation in comprehension recovery has been demonstrated [17].

Prognostic factors for spontaneous recovery have been investigated by several authors: biographical data such as sex, age, and hand preference are no longer considered as significant prognostic indicators and do not appear to influence the outcome of aphasia rehabilitation [18].

A greater prognostic value is attributed to stroke-related clinical variables such as the severity of the stroke, the size and site of the lesion, and the type and initial severity of aphasia [19]. Emotional state and social participation of the patient influence the recovery as well, but do not seem to be strong predictive factors [20]. On the other hand, low levels of motivation and engagement in the patient during the rehabilitation are factors predicting poor or null treatment outcome [21].

Other major indicators predicting the quantity and quality of recovery include the severity of the auditory comprehension deficit and intensity of rehabilitation [22, 23]. A multicenter study is now being conducted by the RELEASE group (REhabilitation and recovery of peopLE with Aphasia after StrokE (NIHR http://www.aphasiatrials.org/index.php/prognosis-and-predictors-research/2-uncategorised/137-rehabilitation-and-recovery-of-people-with-aphasia-after-stroke-release) including datasets from more than 1000 studies and approximately 5000 patients over the world, in order to address the main prognostic clinical determinants of aphasia evolution and the specific role of speech and language therapy (SLT) on this.

SLT is widely offered to patients with aphasia and conducted by speech pathologists worldwide. Guidelines for neurorehabilitation are mainly focused on compensational strategy training [24]. These strategies do not aim to restore brain functions, but aim to compensate for the lost function by using remaining intact functions. For example, in the case of severe oral naming impairment, exercises of written naming can help in compensating the communication output. On the other hand, restorative treatment aims at regaining language processing by using and stimulating the remaining linguistic network [25]. Restitution-focused treatments commonly consist of massed frequent repetition or stimulation of the affected function and have proven to be effective in aphasia, particularly in naming domain [27]. It has been suggested that these two approaches, albeit effective in all recovery phases, should be timed differently because of their competition for available plasticity [26]. According to Code [2], restorative treatment is effective when provided during the supposed phase of spontaneous recovery (when the neural network is able to restore) and can be directed at specific linguistic processes such as phonology, semantics, or syntax, triggering the premorbid language network; later compensational treatment should be applied. Functional MRI (fMRI) correlates of restorative therapies have been described both in early [28] and chronic post stroke aphasics [29]. In the early phase (from 2 days post stroke to 2 weeks post stroke), an increased activity in the left inferior frontal gyrus has been reported, correlating with behavioral measures, whereas in chronic patients, a deactivation of some left frontal areas, probably reflecting higher processing efficiency in cortical network, has been shown using naming tasks [28].

There is no universally accepted treatment that can be applied to every person with aphasia, and typically therapists select from a variety of theoretical approaches, delivery models, and intervention regimens to manage and facilitate rehabilitation. Recently, a Cochrane review conducted on more than 3000 individuals from 57 RCTs [30] reports the effectiveness of SLT for people with aphasia following stroke in terms of improved functional communication, reading, writing, and expressive language compared with no therapy. Authors reported some indication that therapy at high intensity, high dose, or over a longer period may be beneficial, although in clinical trials higher dropout rates in high intensity groups of patients has often been observed. Though, high-intensity and high-dose interventions may not be acceptable to all. A significantly greater effect of high-intensity aphasia therapy, compared to long duration low intensity programs, has also been reported by others [23]. Also, the efficacy of melodic intonation therapy—targeting prosodic and supra-segmental features of language has been reviewed [31] and,

albeit the low quality of many studies, evidences suggest its efficacy in selected individuals.

SLT started early after stroke is commonly promoted in clinical practice [32]; however, there is no conclusive evidence supporting these "the earlier, the better" notion. Recently, very early (2 days) interventions have been reported to be related to greater language improvement, compared to no treatment in a selected group of non-fluent aphasics [28], but generally SLT is initiated according to the general clinical conditions of patients and to their ability to be engaged in effortful tasks. SLT is recommended for aphasic people within 4 months post onset [33], but a recent randomized clinical trial supports the efficacy of high-intensity (3 months duration, > 10 h/week) therapy also for chronic (> 6 months duration) aphasics on verbal communication in everyday life scenarios [34].

Language evaluation

Language evaluation is necessary in aphasic patients both for helping clinicians in diagnosing the type and severity of language disorder and for guiding speech therapists in conducting rehabilitation. It is important to correctly evaluate aphasia severity at different time points and formal language evaluation, together with scoring of functional abilities of communications that must be repeated over time in patients with appropriate tests with norms for different languages. As language impairment modifies very quickly in the first days after stroke and patient's collaboration may fluctuate, a brief evaluation is more appropriate within the first week post stroke, if the patient's vigilance and collaboration allow it. This first screening does not provide a detailed description of the characteristics of aphasia but, rather, aims at monitoring changes in the severity of language impairment and suggesting the eventual evolution and prognosis of aphasia. Standardized and non-standardized methods are currently used to screen different language modalities, i.e., speech production (spontaneous speech, naming and repetition), comprehension, and reading or writing abilities, together with the presence/absence of dysarthria. More frequently used standardized assessment tools in Italian language for the acute phase are Esame del linguaggio al letto del malato "E.L.L.M." [35] and Esame Neuropsicologico per l'afasia "E.N.P.A." [36]. It is also strongly advised to evaluate other possibly coexisting neuropsychological deficits, such as apraxia, agnosia, and visual fields defects, and to consider if preexisting cognitive impairment or dementia may hamper aphasia outcome. Concurrent cognitive impairment in patients with post stroke aphasia needs to be taken into account, also for addressing language rehabilitation. Raven's progressive matrices (RCPM) [37] are useful for addressing non-verbal reasoning, instead of MMSE [38], which depends on verbal expression and not suitable for severe aphasia. On the other hand, RCPM are time dependent and for this reason more indicated after the acute phase (when vigilance and collaboration of patients improve). Critically, intelligence seems to have a negative impact on the initial aphasia severity, but not on the degree of recovery of language function [39].

In Italy, after a permanence in stroke units of generally 1 to 2 weeks, post stroke aphasic patients are commonly transferred in rehabilitation units, mainly if also affected with hemiparesis, or sent to a language rehabilitation out-patient setting. In both cases, patients are usually evaluated by speech pathologists by means of a more comprehensive assessment of language and communication functions, through standardized tests that can be repeated over time. The Aachen Aphasie test (AAT) [40] provides Italian norms and good repeatability and is widely used in order to follow changes in language deficits. The Token test, which mainly tests oral comprehension and comprehension of syntax, is useful for diagnosing aphasia in milder cases with prevalent receptive deficits and to monitor its evolution [41]. If modality-specific language impairments are found, the examination of semantic or grammatical aspects is useful, by using the Batteria per l'analisi dei deficit afasici (BADA) [42]. If a specific impairment affects one or more categories of nouns or verbs, frequency of use, familiarity, length, and age of acquisition must be taken into account [43]; also the semantic knowledge of named or not named items can be investigated [44, 45], in order to plan specific rehabilitative interventions in selective cases. Together with formal assessment of language, also functional scales are needed to evaluate the patient's communicative effectiveness and quality of life. A frequently used scale for communicative abilities is the Communicative Effectiveness Index [46] and a general questionnaire for quality of life related to aphasia is SAQOL-39) [47].

Repeated language evaluations at different time points during the follow-up are needed in order to monitor aphasia evolution, to suggest changes in rehabilitation procedures, and to evaluate when the language function appears to be stabilized and no improvement is detectable either in formal testing or in functional communication, suggesting the end of SLT, possibly with regular follow-ups. Though there is absence of published guidelines about specific time points of follow-up of aphasic patients, clinical experience suggest to repeat monthly language testing in the first 6 months post stroke and subsequently delay the assessments, in order to capture appreciable improvements. Individualizing the scheduled formal evaluation should be taken in mind, as the evolution of a mild aphasia may lead to a complete recovery within a few months, whereas severe fluent or global aphasias usually change more slowly, particularly after 6 months post stroke. The results of the RELEASE collaboration group will help in clarifying the time of changes in different aphasia subtypes in relation to other clinical variables.

After individual SLT is stopped, other home-based or group conversation techniques may be useful in patients [33]. Home-based telerehabilitation [48] is also under investigation, in order to overcome financial restrictions in healthcare regarding rehabilitation procedures as well as travel time sparing for both patients and therapists.

Different techniques in SLT

There is no level I evidence of treatment effectiveness supporting the use of one therapy of intervention above one other, but there is solid evidence supporting the effectiveness of cognitive-linguistic therapy (CLT) [30, 49, 50] in the post acute phase of left hemisphere stroke and in chronic patients. CLT encompasses a broad number of impairment-based approaches, from linguistic stimulation to cognitive neuropsychology: the choice of the therapeutic approach should depend on patient's characteristics and therapeutic goals. So CLT can focus on deficits in linguistic components, such as semantics (word meaning), phonology (speech sounds), and syntax (sentence level) as well as on writing or reading and aims at restoring linguistic processes that are impaired. One of the most crucial parts of cognitive-linguistic therapy is to possibly incorporate ecological tasks during treatment, which is supposed to improve efficacy in everyday life [51]. Other interventions targeting non-linguistic cognitive functions (e.g., working memory, attention, executive functions) may have positive effects on language recovery, if necessary.

Other therapeutic approaches include pragmatic-conversational therapy. Despite a strong evidence supporting its efficacy on the generalization and long-term maintenance of treatment gains in post stroke rehabilitation that is not available, pragmatic-conversational therapy can be used to improve global communication skills, reduce the impact of language impairment, and promote communication within the family particularly in more severe aphasics [52]. Conversational therapy focuses on compensation by making use of all communicative channels and preserved verbal as well as nonverbal communicative functions. Therapy is provided in a realistic everyday environment and uses gestures, communication aids (such as an icon board), and role plays. Verbal communication support strategies such as writing or drawing can be used too. This kind of therapy requires specific training and its effectiveness depends on patient's engagement as well as on environmental and cultural factors. Augmentative and alternative communication (CAA) therapies are used to supplement or replace speech or writing in patients with severe communication deficits. A wide variety of AAC systems exists, ranging from low-tech, involving simple photographs or paper-based communication books and boards, to high-tech, involving sophisticated voice output devices. CAA strategies and tools need to be carefully chosen and programmed by the speech-language pathologist and require specific trainings for both the patients and their caregivers [53].

To promote the generalization of treatment effects to everyday environment, improve psychological well-being in family, and reduce the negative impact of language impairment on patients, particularly in chronic ones, group therapies are considered to be useful. Functional communication abilities are reported to improve with group therapies if guided by an expert.

Finally, computer-based therapy using language therapy programs can integrate individual speech-language therapy and can be used at home by patients with treatment access difficulties. Therapeutic benefit have been reported also in chronic patients [54]; however, the efficacy of this kind of treatment and its effect on the generalization of treatment gains in post stroke language rehabilitation needs further evidence.

Several pharmacological treatments have been tried with the aim of improving aphasia, e.g., dopamine agonists, piracetam, amphetamines, donepezil, and AchE inhibitors. Evidence suggests piracetam can have positive effects on post stroke language recovery when used in conjunction with SLT, whereas bromocriptine proved to be ineffective in non-fluent aphasia treatment [55].

Concluding suggestions for clinical managing of post stroke aphasia

The management of the aphasic patient begins in the post stroke acute phase and continues throughout the subacute and chronic phase, often involving multiple healthcare institutions and professionals. In clinical practice, during the acute phase, Italian stroke patients are usually hospitalized in stroke units for the first 7–14 days, where, concurrently with medical care and according to their vigilance and collaboration, they are submitted to language tests, in order to assess aphasia severity, make prognosis on its evolution, according to stroke related factors, and, if possible, start with early language therapy. Monitoring language changes in the post acute phase is recommended by recent NICE guidelines on stroke, as the effects of spontaneous language recovery, due to reduction in diaschisis and edema can induce a modification in aphasia profile [33].

In Italy, after discharge from the stroke unit, patients with associated motor deficits are usually addressed to a neurological rehabilitation structure, whereas those ones with language

disorders only may be sent to a speech pathologist in an outpatient setting.

In both cases, patient's complete language examination allows behavioral neurologists and speech pathologists to make a prognosis about aphasia recovery, with realistic therapeutic goals in accordance with patient's characteristics, needs, abilities, family context, environmental barriers, and available resources.

There is general agreement about tailoring the rehabilitation program to the individual patient's characteristics. Furthermore, severity and type of aphasia usually drive the interventions [10]: in case of mild or very specific language deficits, the cognitive-linguistic treatment aimed at restoring lost functions, targeting specific linguistic processes (phonology, semantics, syntax) is usually used. In case of severe multi-domain language deficit, the treatment will aim at compensating for it, integrating residual language capacities with alternative communication methods and strategies, in order to improve global communication skills and reduce the impact of language impairment on patient's psychosocial functioning and participation. Research suggests that high-intensity treatments are effective, but a specific indication about time and quantity of the treatments is still not available [33]. Rehabilitation of chronic aphasics also needs to be further investigated in clinical trials, as the majority of patients included are within 12 months post stroke [30]. Effective discharge planning is essential for smooth transitions through the continuum of care.

Multiple opportunities should be made available, for both patient and carer to discuss their available options as well as any fears or concerns. Since there is no evidence that proves its efficacy, it is not recommended as a maintenance therapy to prevent the worsening of linguistic abilities [33].

The authors' experience suggests that also the end of rehabilitation needs to be individualized, either in case of completely recovered aphasia or in case of a stabilization of language impairment and the lack of further observable changes in formal testing or in functional communication.

Regular follow-ups are useful, in order to repeat the treatment if some worsening occur. Also, group conversational therapies may be suggested.

Because communication deficits caused by aphasia affect both aphasic patients and their communication partners, and because the burden of facilitating communication and transition to the community often falls on family members, they need to be included in the overall management program since the onset of the stroke. Engagement of relatives in the therapy is essential to the success of the therapeutic program and to the generalization of treatment gains to everyday environment [33].

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Compliance with ethical standards

Conflict of interest The author declares that she has no conflict of interest.

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