



COVID-19 and Aphasia

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Abstract

Purpose of Review Aphasia is an acquired neurological language disorder after brain damages. Persons with aphasia (PWA) are more susceptible to behavioral and emotional implications due to inherent communication and/or cognitive difficulties. Currently, little is known regarding the impact of COVID-19 on PWA.

Recent Findings There are now growing reports with evidence of neurological and dysexecutive syndromes subsequent to interference of brain functions in acute patients with COVID-19, leading to variable aphasia-like symptoms. COVID-19 affected chronic PWA more in terms of disrupted communication and daily routines, worsened psychosocial well-being, and difficulties getting aphasia services that adequately addressed their needs.

Summary Acute versus chronic PWA were disproportionately affected by COVID-19. Recognizing, examining, and managing COVID-19-related neurological and behavioral problems in PWA is not straightforward. As we passed the 1-year mark and approaching the 2-year mark of the onset of COVID-19, more research is necessary to prioritize strategies for improving current evidence-based care and rehabilitation of aphasia.

Keywords COVID-19 · Aphasia

Introduction

Aphasia is an acquired disorder of language functions that affects one's ability to understand, speak, read, and write [1•] across various performance levels from word, sentence, to discourse [2]. The most common etiology of aphasia is stroke, but other leading causes include dementia, traumatic brain injury, and brain tumors. Currently, there approximately two million persons with aphasia (PWA) in the USA [3] and an estimated total of 360,000 PWA in the UK (based on a reported total of 1.2 million stroke survivors and 30% incidence rate of stroke-induced aphasia [4]).

Recovery of language functions among PWA typically occurs in three overlapping phases, each of which characterized by specific underlying neural phenomena with exhibition of distinctive aphasic symptoms [5]. In the *acute* phase, which starts from the onset to the first

few weeks of a stroke, reorganization and improvement of language functions is highly dependent on the extent of successful reperfusion of the infarcted tissues and hypoperfused areas of the brain. In the *subacute* phase that is the time between three and six (or up to nine) months post onset of the stroke, increased language functions are typically associated with resolution of diaschisis (i.e., decrease in hypoperfusion and/or hypometabolism of structurally unaffected or normal regions proximal and/or distant from lesion site or sites including the right hemisphere). The majority of spontaneous language recovery is usually seen in the acute and subacute phases following the initiation of a cascade of regenerative events (neuroplasticity), but the degree and pattern of positive changes can be influenced by factors such as aphasia subtype or severity [6]. Regarding the *chronic* phase, the time of 6 or 9 months post-onset and beyond, speech and language therapy has been found to have positive implications to increased language functions. These restorations are associated with and, in most cases, induced by reengagement of the residual tissues in and perilesional region of the left hemisphere.

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Case Reports of Acute Aphasia Caused by COVID-19

COVID-19 is a new disease caused by a coronavirus that is novel to humans. The first cluster of clinical cases was reported to appear in December 2019 [7]. Effects of COVID-19 are predominantly symptoms of pulmonary dysfunctions (such as sore throat, cough, fever, fatigue, and pneumonia), but atypical extrapulmonary manifestations of symptoms extending to organs beyond the respiratory system have been reported (including cardiovascular, renal, hepatic, gastrointestinal, ocular, dermatologic, and neurological systems) [8]. In particular, a few case reports have summarized the neurological manifestations of COVID-19 that have led to aphasia or aphasia-like symptoms among patients in the acute and/or subacute stages.

A subset of these reports are related to acute aphasia caused by encephalopathy. For example, Muccioli et al. [9•] summarized a 47-year-old (middle-aged) woman in Italy presenting an expressive aphasia and inattentiveness in the acute phase of encephalopathy. While this patient's respiratory failure was mild, dysexecutive syndromes secondary to frontal lobe dysfunction have caused anomia (i.e., word finding difficulties), agrammatism, and sporadic semantic paraphasias in language output. Following a pharmacological treatment (with tocilizumab), the aphasic and behavioral disturbances and neuropsychiatric symptoms of confusion and agitation have resolved 2 months post-onset. Pensato et al. [10] described a 54-year-old Italian man who demonstrated acute aphasia at the time of hospitalization, with resolved language functions in 2 weeks following a reversible COVID-19-related encephalopathy. Unlike the case of Muccioli et al. [9•], this male patient initially exhibited severe respiratory and neurological complications, with acute and non-fluent aphasic characteristics including effortful and slow speech rate, phonological paraphasias, and neologisms but relatively preserved auditory comprehension. Subsequently, his language disturbances progressed to occasional anomia by day 5, close-to-normal neurological and linguistic status by day 7, and unimpaired communication by day 10. The patient's neurological and respiratory status was reported to have resolved completely 2 weeks post aphasia onset, except for dysgeusia.

There are also some reports that summarized COVID-19 patients with acute ischemic stroke associated with coagulopathy that had caused venous and arterial thrombosis. For example, Priftis et al. [11•] presented a 53-year-old male patient in Italy who sustained a left-hemisphere ischemic stroke. After signs of fever for the first 2 weeks and being admitted to an emergency room with subsequently confirmed contraction of COVID-19, this patient

exhibited symptoms of aphasia and some behavioral agitation. Based on the results of a published neuropsychological examination for aphasia in Italian [12], the patient was found to be spared in sensorimotor and cognitive functions, except for selected aspects in the language domain. He was diagnosed with a conduction aphasia, which was evident by fluent discourse production of conversation and picture description, good oral and written naming of nouns and verbs, impaired repetition (at the sentence level), phonological paraphasias, and good auditory and written comprehension of single words and sentences. Although the ability to read aloud words, non-words, and sentences was intact, his corresponding performance on writing was severely impaired as shown by massive paraphasias of grapheme omissions and substitutions. Beyrousti et al. [13] also described two male patients in the UK sustaining ischemic stroke that had caused aphasia, including a 73-year-old man who showed aphasic features 8 days after the onset of COVID-19 symptom onset and another 64-year-old man with anomia 15 days after COVID-19 symptom onset. The medical history of both patients was not eventful in terms of cerebrovascular accidents. Finally, Avula et al. [14] reported an 80-year-old female patient in the USA with confirmed ischemic stroke-induced aphasia; she had a higher incidence of risk factors including hypertension and old age.

To summarize, there is now growing evidence of neurological disorders and dysexecutive syndromes subsequent to interference of brain functions across patients with COVID-19 [15–17]. However, given the small number of publications on stroke and COVID-19 published thus far and the high heterogeneity of these patient profiles, we cannot confirm a causal relationship between the severity of COVID-19 (and therefore the respiratory and neurological symptoms) and aphasia. Moreover, information pertaining to the exact stroke mechanism (for example, coagulopathy versus pulmonary emboli [18] versus cerebral venous sinus thrombosis [19] and other stroke types), phenotype, and lingering effects of the corresponding neuroinvasion among PWA is scant and remains uncertain at present. To allow a more comprehensive understanding of the neurological pathology of COVID-19 and how the nervous system is affected, further studies are needed. In general, complications of language disturbances associated with acute aphasia can be one of the earliest features of COVID-19 among patients with neurological manifestations but still merit additional study; this should not be neglected by clinicians.

Chronic PWA in the COVID-19 Pandemic

Unlike PWA in the acute or subacute phases who may be battling with life-threatening health conditions related to COVID-19, those living in the chronic stage may face

challenges in decreased participation in social networks and play a less active social role to achieve personal life goals, engage family and friends, manage household or civic duties [20], or handle occupational activities and return to work [21]. Apart from enhancing the inherent communication difficulties, chronic PWA often benefit from community-based aphasia services and reduce negative social and emotional sequelae. For example, it has been reported that 3 weeks of intensive speech and language therapy (containing at least 10 h per week) could significantly improve the verbal communication skills in chronic post-stroke PWA aged 70 years or younger [22]. Based on the results of a systematic review of intervention for chronic PWA [23], multiple options have also shown evidence to be effective treatments for chronic aphasia, including group language therapies, repetitive transcranial magnetic stimulation, transcranial direct current stimulation, computer-based treatments, constraint-induced therapy, and training conversation or communication partners.

Remote Services to Chronic PWA

Most clinical services to PWA have been hit hard by COVID-19. As a response to the pandemic, the majority of health care services worldwide had to be modified from a specialized behavioral, in-person, facility-based setting to a virtual, internet-based, technologic medium at a rapid pace. These changes were necessary to prevent cessation of clinical treatment for those in need and avoid any potential regression among patients; such modifications of regular face-to-face visits also required a great demand of flexibility and creativity on the part of service providers (i.e., multispecialty clinicians) [24, 25]. Subsequent to these changes, many PWA were not only disrupted in receiving conventional aphasia therapy or participating in community-based activities amid the pandemic, but also had to abruptly transition to teletherapy [26, 27, 28]. It is believed that although some of this transfer of case-load over to telehealth sessions could have been based on PWA's preference, this sudden switch to an unexpected option using a variety of platforms could have also posed unnecessary stress and worries to PWA (and their caregivers) in many ways. Some examples include PWA being anxious about this new and strange remote setting of therapy delivery, their difficulties to pay attention to and stay on tasks virtually due to screen fatigue [29, 30, 31], technical difficulties they could encounter as navigating a novel platform of presentation of therapy items, and barriers to accessibility to internet and technology [32]. Although the cost-effectiveness [33, 34] and usefulness and efficiency of telepractice in chronic PWA have been reported (for example in terms of PWA's improvements

in overall impairment levels and functional communication [34, 35], enhanced naming performance [36], positive changes in PWA's conversation through training communication partners [37], and PWA's increased engagement in communicative activities and communication-related quality of life [38]), one should not neglect the factors that determine the suitability and candidacy of PWA to receive online intervention. These factors include type and characteristics of the treatment involved; feasibility for PWA to engage in real-time synchronous therapy versus asynchronous self-mediated practice via telerehabilitation; PWA's endurance and tolerance level of high versus low intensity of training; and the unique inherent perceptual, cognitive, and/or psychomotor barriers in PWA secondary to stroke or brain damage [39]. On top of these potential restrictions, some of the earlier-mentioned intervention for chronic PWA [23] may not be logistically feasible to be conducted online.

To summarize, the COVID pandemic has undoubtedly precluded PWA from receiving conventional rehabilitation that enables them to lead a "normal" life. The heterogeneity nature of managing aphasia online might have also made it a difficult process for PWA, their carers, and clinicians to adjust [40]. Nevertheless, telepractice has been utilized as an effective alternative to in-person aphasia therapy and some recent reports have suggested that it is a viable method of service delivery for PWA during this unprecedented crisis, with endorsement of a high level of satisfaction from rehabilitation professionals and adult patients [41, 42].

Mental Health and Coping During COVID-19

Negative aphasia outcomes have been found to associate with poor social support and social networks post stroke [43, 44], which can be manifested by a higher level of mental distress, poorer recovery, and diminished quality of life [45]. Unlike healthy elders, PWA typically have less diverse social networks and are more prone to problems with friendship or engaging with peers [44, 46]. Approximately 33% of chronic stroke survivors experience depression [47]; more critically, PWA with depression tended to have poorer functional recovery, increased social isolation, and higher reliance on public health care resources [45]. With no doubt, the COVID-19 outbreak has exacerbated these psychosocial implications to PWA due to the unavoidable disruptions on both the individual and social levels. A recent review by Kong [48] has explained how some previous or existing public health guidelines to prevent the spread of the virus (ranging from voluntary practicing of social distancing to more restrictive shelter-in-place orders or mandatory closure of society) are contrary to the traditional principles of enhancing PWA's social participation and reducing their psychological distress when we manage aphasia. More

specifically, the increase in loneliness during the pandemic resulting from feeling socially isolated and dissociated (disconnected from the present moment) could subsequently induce more adverse emotions (such as fear, worry, stress, and anxiety) or neuropsychiatric sequelae (such as insomnia or delirium) [49]; these impacts were generally magnified on vulnerable populations, such as those with aphasia [50]. On a practice level, PWA with cancellation, suspension, termination of, or shortened pre-arranged speech-and-language therapy sessions and cognitive stimulation programs might face worsening of behavioral symptoms and neuropsychiatric traits, respectively.

At the time of this writing, only a very small number of retrospective survey studies, focusing on the psychosocial difficulties experienced by chronic post-stroke PWA during the COVID-19 pandemic, have emerged. In particular, Pisano et al. [51••] have examined the adverse influences of 1 month of lockdown in Italy on several psychosocial dimensions of PWA, including depression, anxiety, communication, and social isolation. The results revealed a significantly higher level of PWA's anxiety and depression, on top of a significantly lower self-rating on their perceived quality of life. It was also observed that these reported negative changes did not seem to be affected by aphasia severity or PWA's age, education, or gender; this highlighted the "across-the-board" consequences that applied to all PWA in general. Another investigation was conducted in Hong Kong to estimate how social distancing measures implemented to mitigate COVID spread (including but not limited to social distancing measures, stay-at-home orders, and lockdowns) have impacted PWA's psychosocial well-being [52••, 53]. The findings suggested that the pandemic had caused a higher degree of anxiety, depression, and stress in PWA. The overall psychological well-being, in terms of six dimensions of mental functioning: (1) autonomy, (2) purpose in life, (3) environmental mastery, (4) personal growth, (5) positive relations with others, and (6) self-acceptance, also worsened.

In summary, daily activities and routines of PWA have been disrupted by COVID-19, leading to multi-faceted social, emotional, and behavioral implications. Dealing with the pandemic can be a frightening or even traumatic experience. The majority of PWA worldwide are still overcoming many obstacles and have little-to-no concrete idea about how to resume their most valued activities amid the pandemic. A quarantine (or coming out of quarantine) can also be stressful on the part of PWA and professional support can help with coping. It is important that PWA remain optimistic, seek professional help, and reach out for assistance or additional resources if these negative feelings persist [54, 55]. Longitudinal follow-up studies are also warranted to ascertain the long-term psychological consequences and potential lingering effects of this pandemic on PWA.

Perspectives

There are growing reports of different COVID-related complications with pathogenesis that remains underresearched or unknown. This gap of knowledge with various degrees of uncertainty seems to be complicated by the surge in cases contributed by different existing variants of COVID-19 (and especially the new Delta and Lambda variants) across the globe. Examples of these reported symptoms include (1) mild and subclinical cognitive decline in older individuals with mild symptomatic COVID-19 infection [56]; (2) mild neuropsychiatric deficits in short-term memory, attention, and concentration among middle-aged individuals with mild and moderate COVID-19 [57]; and (3) global worsening of the neuropsychiatric profile in elderly with existing cognitive impairments (e.g., Alzheimer's disease and mild cognitive impairment), with particular problems in agitation, depression, anxiety, and changes in appetite [58]. The elderly population, and especially those with comorbidities (such as aphasia or dementia), is vulnerable at risk of contracting COVID-19 [59•, 60, 61]. Currently, there are no formal statistics relative to the infection rate of COVID-19 in PWA (see a new COVID-19 Neuro Databank/Biobank that gathers information on COVID-related neurological outcomes [62•]). Further research is required to fully examine whether and how these reported symptoms with underlying mechanisms that are yet fully understood may exacerbate the vulnerability of aphasia who typically presents with language and/or cognitive impairments; this is a daunting task but will render clinical practitioners involved in aphasia diagnosis and treatment useful information on the consequences of COVID-19.

In this new era of coronavirus, clinicians can empower PWA to be advocates and act as a valuable sources of information to make more informed decisions on aphasia rehabilitation; this will not only ensure PWA's specific needs during and/or after the pandemic are addressed, but also improve the quality of care in clinical practice. With reference to the International Classification of Functioning, Disability and Health (ICF) developed by the World Health Organization, Wallace et al. [63•] have attempted to identify treatment outcomes important to aphasia management. Specifically, by analyzing opinions from PWA and their caregivers, desires and preferences of care from their perspectives were systematically analyzed. It was concluded that treatment outcomes that linked to ICF components of activity/participation, environmental factors, and body function were considered to be more important and prioritized. Several of these outcomes become even more critical because this pandemic has posed huge and particular challenges to PWA. More specific details and examples of outcomes are given listed in [63•] on thematic

categories of “increased life participation,” “improved physical and emotional well-being,” “improved health (and support) services,” “recovered normality,” and “improved communication” (see also essential outcome constructs listed in [64] on “emotional well-being,” “quality of life,” “language,” and “communication”).

Like many clinical services, regular speech and language therapies have been hit hard by COVID-19. For most clinicians, delivery of alternative models of PWA services (e.g., teletherapy or technology-mediated exercises [e.g., 33, 65, 66]) was a trial and error process as they were learning and exploring various new options and corresponding implementation standards. These changes have created opportunities for appraisal and/or expansion of existing services [67••] and made many clinical teams well-prepared for whatever restrictions that may come in the future [68, 69]; the culture of communicative accessibility that can improve social connectedness for PWA can also be promoted [70], echoing a recent call for “Physical Distancing and Social Connectedness” (PDSC) aphasia treatment and support groups to improve PWA’s social and emotional fulfillment [71•]. Lam et al. [72] has illustrated how telepractice efficacy was highly rated by different service receivers (students and parents, to be specific) during the pandemic; one may assume that this would be the case too regarding satisfaction level of PWA and caregivers although, at present, similar reports are still lacking in the Aphasiology literature.

Conclusion

Individuals with acute versus chronic aphasia are disproportionately affected by COVID-19. Early recognition and investigation of COVID-19-related neurological and behavioral disease is far from straightforward. Providing adequate support to PWA, one of the vulnerable and high-risk groups within the context of the pandemic, should be made a top priority of management. This can be strategically achieved through different means, such as integrating technologies in aphasia rehabilitation, improving PWA’s mental health, strengthening their virtual engagement (and subsequently community re-integration), and revisiting aphasia services to respond to their needs.

Declarations

Conflict of Interest No potential conflict of interest was reported by the author.

Human and Animal Rights This article does not contain any studies with human or animal subjects performed by any of the authors.

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