

# Update on Recent Developments in Communication and Swallowing in Multiple Sclerosis

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**Swallowing and communication disorders are common in persons with multiple sclerosis (MS). Both disorders are extremely variable and can have a major effect on health status and quality of life. This is why it is important to provide health care professionals who are working with persons with MS with tools to signal, assess, and treat swallowing and communication disorders. This synthesis gives an update on relevant and recent literature on swallowing and communication disorders, supplemented with current practice-based evidence. Studies on swallowing and communication disorders in MS are scarce: more and higher-quality research is needed. It should be emphasized that therapists need to focus on the patient's acquisition of skills to participate in daily life. This means that each patient requires an individual approach based on their own needs. *Int J MS Care*. 2020;22:270-275.**

**H**ealth care professionals who work with patients with multiple sclerosis (MS) often encounter communication disorders and/or swallowing disorders (dysphagia). This common encounter underlines the importance of a synthesis of relevant and recent literature on communication disorders and dysphagia in MS and the current evidence base practice for interventions. Because the World Health Organization International Classification of Functioning (ICF)<sup>1</sup> has shifted the focus of rehabilitation from a specific impairment toward the acquisition of skills to participate in daily activities, we have tried to cover all areas of the ICF in this synthesis.

Although eating, drinking, and communicating are important parts of our everyday lives, people are often unaware of the impact of not being able to swallow or communicate because these functions are usually self-evident. A dysfunction in one of these areas could have major consequences not only for a person's health status but also on activities and participation because most social activities consist of chatting, often planned around eating and drinking.

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This narrative review gives an overview of the pathophysiology, clinical representation, diagnostic evaluation, treatment, and implications for clinical practice of dysphagia and communication disorders (dysarthria and cognitive communication disorders) in MS. We searched PubMed and Google Scholar for these topics, restricting the searches to publications written in English and published between 2000 and 2020.

## Dysphagia

### Pathophysiology

Dysphagia is the disruption of the semiautomatic process of swallowing through which food is conveyed from the mouth to the stomach. The deglutition mechanism requires high coordination of distributed neural networks involving both cortical and brainstem regions. Dysphagia in MS seems to correlate with overall disability score<sup>2,3</sup> measured using the Expanded Disability Status Scale.<sup>4</sup> Dysphagia may be encountered in persons with MS with mild disability,<sup>5</sup> although it is more frequent in the advanced stages of the disease and in persons with MS with evidence of brainstem or cerebellar damage.<sup>6</sup> The severity and type of dysphagia symptoms may be heterogeneous among persons with MS, and its characteristics tend to vary in relation to the predominant pathophysiologic mechanisms.

### Clinical Representation

Dysphagia may be a recurrent symptom, especially in the advanced stages of secondary progressive MS and primary progressive MS, with an overall prevalence varying from 33% to 90%.<sup>7</sup> Terre-Boliart et al<sup>8</sup> report a 40% occurrence of silent aspiration in a group of

patients with moderate-to-severe MS. The dysphagia symptoms are determined by muscle weakness, spasticity, and/or ataxia. The symptoms may worsen in the presence of cognitive impairment.

Dysphagia in MS includes difficulties in the oral and pharyngeal phases of swallowing. Symptoms observed in the oral phase are problems with chewing and bolus formation, reduced sensitivity, and reduced tongue strength. However, most difficulties occur in the pharyngeal stage,<sup>2</sup> where a reduced swallowing reflex, reduced tongue base retraction, reduced pharyngeal contraction, reduced laryngeal elevation, reduced cough reflex, reduced or delayed relaxation of the upper esophageal sphincter, and timing problems can be present.

Persons with MS note food sticking in the throat, coughing or choking on solid food or liquids, difficulty initiating swallowing, and altered feeding habits.<sup>3</sup> Dysphagia may be highly distressing and may have a disastrous effect on quality of life (QOL). If not adequately assessed and managed, dysphagia may lead to a high risk of malnutrition, weight loss, dehydration, and pneumonia due to food aspiration. These complications may lengthen hospital stays.<sup>9</sup> Moreover, aspiration pneumonia is one of the leading causes of death in people affected by MS.<sup>10</sup>

### Diagnostic Evaluation

In general, three types of diagnostic techniques are used to identify dysphagia in MS: questionnaires and screenings, clinical assessments, and instrumental examination.<sup>7</sup> The DYsphagia in MULtiple Sclerosis (DYMUS) questionnaire, which has been validated in multiple languages, is the only questionnaire specifically developed for MS. However, the authors themselves warn us to be cautious regarding interpretation of results due to possible lack of awareness of dysphagia symptoms in persons with MS. In addition, questions about its diagnostic accuracy arise because the questionnaire was compared only with a subjective reference test. In the work field, questionnaires such as the 10-item Eating Assessment Tool and the Swallowing Quality of Life questionnaire are used as well.

Assessments not specifically targeted to the MS population but for neurogenic dysphagia are commonly used for screening: the Yale Swallow Protocol, the Gugging Swallowing Screen, and the Test of Masticating and Swallowing Solids. These assessments focus on (non) fluid aspiration and solid bolus ingestion.

Furthermore, a complete in-depth clinical assessment should comprise 1) a complete and careful history of any swallowing disorder, 2) evaluation of motor and sensory functions of cranial nerves involved in the deglutition process, 3) assessment of voluntary and reflex cough, 4) systematic trials with different food and liquid textures

and posture modifications to define which modifications might improve safety during alimentation, and 5) meal observations to capture the influence of distraction and eating habits.

Due to a decline of sensory capacity, persons with MS might pass these screening assessments, and an in-depth clinical assessment may end up being less accurate. Because silent aspiration is often missed with subjective screenings and clinical assessments, (objective) instrumental evaluation is the most informative. Instrumental assessment includes videofluoroscopy and/or fiberoptic endoscopic evaluation of swallowing, testing the risk of penetration/aspiration and residue with all consistencies, as well as the effects of behavioral strategies and bolus alterations.

### Treatment

Generally, the aim of dysphagia management is to improve the efficacy and safety of swallowing, maintaining a normal diet as long as possible and preventing the risk of involuntary aspiration of liquids or food. Dysphagia treatment generally may be divided into three methods: rehabilitation, compensation, and adaptation. Rehabilitation techniques mainly consist of resistance, strengthening, accuracy, and coordination exercises to improve range of motion and movement efficacy of the oral and pharyngeal structures during swallowing. The compensatory approach consists of postural changes and swallowing maneuvers, such as the chin tuck maneuver, head tilt, and head rotation.

Among the adaptation strategies, the speech and language therapist may recommend diet texture and temperature modifications and may change meal times. The International Dysphagia Diet Standardisation Initiative has been developed to use a standardized way of describing texture modifications. In persons with MS where eating and drinking is a burden, (partial) tube feeding might be indicated but should be well overthought because it is life prolonging.

Literature on dysphagia treatment specifically in MS is scarce. A systematic review<sup>6</sup> did not find studies on the effect of swallowing exercises, but it reported studies on the effect of botulinum toxin and neuromuscular electrical stimulation. Although the reported studies showed promising results, there are not sufficient data to support a particular treatment over others, and the methods of the studies have been poor. More recently, Tameshlu et al<sup>11</sup> conducted a randomized controlled trial of traditional therapy (rehabilitation techniques) versus standard care (adaptation and compensation) on swallowing function. Moreover, a randomized controlled trial by Silverman et al<sup>12</sup> studied the effect of expiratory muscle strength training versus a sham condition on swallowing QOL. However, the methods of the found studies are

poor because they included a small number of patients, used inappropriate outcome measures, had insufficient follow-up, or did not use randomization or even a control group.

From this perspective, we should look at treatment options used for dysphagia in other neurologic diseases as well, and we should carefully monitor the effect of the selected treatment. The treatment should be selected focusing on the dysphagia symptoms. Because persons with MS are often unaware of their swallowing problems, psychoeducation is important for acceptance of treatment and the full compliance of the persons with MS.

### Implications for Clinical Practice

Although there is not sufficient evidence on the sensitivity of a specific assessment tool to diagnose dysphagia in MS, National Institute for Health and Clinical Excellence guidelines<sup>13</sup> recommend that every patient with chest infection or any bulbar sign should be asked about any possible difficulty during alimentation. Moreover, these patients should be referred for an assessment by an expert professional (usually a speech and language therapist) who plays a crucial role as part of a multidisciplinary team. All patients with a high risk of dysphagia should be submitted to instrumental assessment, even if they do not mention dysphagia.<sup>5</sup> When food consistency needs to be modified, a dietitian should be consulted. Because there is no clear evidence for one treatment over another, there are many differences between and even within countries in the treatment of dysphagia in MS. Treatment should be individually tailored with a focus on QOL. For rehabilitation techniques, the occurrence of muscle fatigue should be kept in mind.

### Current Developments and Future Perspectives

Lately, dysphagia in MS has been receiving more attention. This is partly due to the development of a new assessment tool, the DYMUS questionnaire, which is currently available in Portuguese, French, Turkish, Persian, and Greek, with more languages to follow. However, there are questions about what the DYMUS questionnaire measures because it has not been compared with an instrumental reference test until now (Ruhaak et al, manuscript in preparation). Further research into an efficient screening tool that is sensitive to slowly increasing dysphagia symptoms and silent aspiration is needed.

A development in the treatment of dysphagia in MS includes research into the use of electrical stimulation. In past years, different methods of stimulation have been studied: stimulation of the swallowing muscles, the vagal nerve, and the pharyngeal motor cortex, the latter being the newest method. All treatments have shown positive

effects, but they included only a small number of participants, and the long-term effects are not known.

The number of studies reporting on respiratory muscle strength training in persons with MS has been increasing in the past decade. A randomized controlled trial<sup>12</sup> with a focus on dysphagia concluded that expiratory muscle strength training with resistance leads to improved swallowing safety and improved swallowing coordination. Again, the group of participants was small, and long-term effects are unknown.

In conclusion, high-quality studies of the effects of dysphagia treatments in MS are required.

## Communication

### Dysarthria

#### Pathophysiology

Dysarthria is a motor speech disorder that results from a deficiency of the motility of muscles devoted to speech and voice production. The complex pathophysiological mechanism of MS may cause different dysarthria symptoms such as spasticity, weakness, slowness, and incoordination of lips, tongue, jaw, vocal folds, or movements of respiratory muscles. Damages that cause dysarthria in MS may be located in the brainstem, as well as the cortex and cerebellum.<sup>14</sup> Dysarthria in MS typically worsens along with the disease course<sup>14</sup>; in particular, expiratory and phonatory durations were found to be significantly correlated with Expanded Disability Status Scale scores.<sup>15</sup>

#### Clinical Representation

Persons with MS may frequently experience dysarthria, with a prevalence up to 45%.<sup>14</sup> Dysarthria is found to be the most frequent communicative disorder in MS.<sup>16</sup> However, dysarthria in MS tends to be mild to moderate, and complete unintelligibility is occasionally present in advanced MS.<sup>17</sup> Dysarthria in MS may have heterogeneous features. Mixed dysarthria, which combines spastic and ataxic symptoms, is the predominant type. The most common features are slowness, intensification of pitch frequency and duration of pauses, scarce loudness control, monotonous speech, inaccurate consonant articulation, hoarse voice, and reduced respiratory capacity.<sup>18</sup> Persons with MS often note slurred speech or being out of breath. It is recognized that dysarthria has an extreme negative effect on overall QOL, especially in terms of social and work participation.<sup>19</sup>

#### Diagnostic Evaluation

Guidelines<sup>13</sup> recommend assessment by a trained speech and language therapist for every person with MS whose ability to communicate is reduced by speech difficulties and/or for every person with MS concerned about it. Currently, there are no MS-specific diagnostic instruments for dysarthria. Dysarthria assessment

includes both objective and subjective measures to categorize the type of dysarthria, and it starts with taking the medical history.

Two questionnaires have been developed to evaluate the physical, functional, and emotional impact of speech or voice problems: the Speech Handicap Index and the Voice Handicap Index. With a nonverbal examination, the morphology, sensitivity, and motility of the structures involved in speech production can be determined. It should be completed with a perceptual analysis assessing every subsystem: respiration, articulation, prosody, resonance, and phonation (eg, Frenchay Dysarthria Assessment or Robertson's Profile). Judgment of intelligibility is the main outcome measure. Moreover, in the past years, different types of spectrographic assessment of speech have been used together with the perceptual analysis to obtain more objective measures.<sup>20</sup>

#### **Treatment**

The main functional outcome of dysarthria treatment is the improvement of intelligibility. In the literature, there is no evidence of efficacy of a specific treatment over another one, but guidelines<sup>13</sup> indicate that every person with MS whose ability to communicate is significantly affected by dysarthria should be given advice by an expert speech and language therapist on techniques to improve speech production and clarity of speech. Given the variability of symptoms, treatment depends on the cause, type, and severity of dysarthria. In general, treatment options may be divided into three different approaches: restorative, adaptive, or compensatory rehabilitation. The restorative interventions are usually focused on a specific subsystem and may include trainings to increase breath support by respiratory muscle strength training as well as respiratory/phonatory coordination; exercises improving vocal parameters (frequency, intensity); exercises enhancing the range, motility, and strength of oral and vocal muscles; and exercises reducing imprecise articulation. Adaptive rehabilitation consists mainly of behavioral techniques aiming to control the rate of speech and the naturalness of speaking. Finally, in compensative rehabilitation, the use of augmentative and alternative communication may be considered.

#### **Implications for Clinical Practice**

From the perspective of the ICF, dysarthria treatments for persons with MS should aim to enhance breath support and phonatory functioning, adjust the rate of speech, and increase articulatory excursion for better clarity in an ecological setting, such as conversation. Cognitive behavioral techniques seem to be a clinically efficient tool to implement an active self-monitoring and self-correction of specific parameters of speech, guided by precise feedback from a speech and language therapist. For the feasibility of the treatment, cognitive

abilities should be kept in mind. To apply different strategies and skills, cognitive capacity is needed.

#### **Current Developments and Future Perspectives**

In a case-control study by Nordio et al,<sup>15</sup> persons with MS received group therapy with a combination of exercises: respiratory exercises, orofacial muscle exercises, and articulation and prosody exercises. No significant treatment effects were found. This could be due to the combination of exercises for different subsystems. Future studies on the treatment should focus on one specific subsystem.

Mefferd et al<sup>21</sup> estimated with kinematic measurements that speech movements of the tongue are more impaired than lower lip movements in persons with MS. Future studies should make clear which compensatory technique improves speech intelligibility.

Rusz et al<sup>22</sup> studied the correlation of dysarthria with brain volume. They found that abnormal diadochokinesis was associated with the loss of cerebellar white matter and gray matter and that a slow articulation rate was associated with bilateral white and gray matter. In the future, dysarthria may be used as a biomarker for disease progression if an objective and validated tool to measure this is found and studies confirm that speech deterioration is sensitive to disease activity.

#### **Cognitive Communication Problems**

##### **Pathophysiology**

Language problems are said to be associated with cortical regions in the brain, whereas in MS the lesions are located subcortically. However, language problems are present in MS. A plausible theory is that the observed language problems are driven by cognitive dysfunction. For this reason, herein we talk about cognitive communication problems instead of language problems.

There is a moderate-to-strong correlation between cognitive symptoms and cortical brain atrophy, magnetic resonance imaging lesions, microscopic pathology of lesions and normal-appearing brain matter, and glucose metabolism in the brain. Cognitive symptoms have been correlated to both gray matter and white matter damage in the brain. Because cognitive communication problems are mainly linked to general cognitive deficits, the pathophysiology behind language impairments is assumed to be similar to the pathophysiology of cognitive deficits.

##### **Clinical Representation**

It is difficult to predict cognitive symptoms in MS. They may already present themselves early in the course of the disease, and all types of MS are linked to some kind of cognitive symptoms, although these are individual. Studies show that 50% to 60% of people with MS show some cognitive deficits; however, the prevalence of language disorders has been estimated to be 10% to

20%.<sup>23</sup> The most common cognitive problems in MS are executive deficits; language impairments are less frequent. Aphasia and anomia are rare in MS. The most commonly identified language symptoms reported to be impaired are word retrieval in verbal fluency tasks (both phonetic and semantic fluency tasks) and naming.<sup>24</sup> Verbal fluency tasks rely heavily on executive resources, which also points to more general executive deficits than a specific language deficit. Naming, on the other hand, reflects problems at different levels of the word retrieval process.<sup>24</sup> In addition, problems have been shown in comprehension or semantic processing.<sup>24</sup> Very few studies have investigated language impairments other than verbal fluency and naming. For example, syntax and discourse abilities have not been examined although these domains involve complex language processes and, thus, also rely on executive resources.<sup>24</sup> Only a few studies have indicated language impairments in spontaneous speech, reflecting pragmatic discourse ability; these studies also link language impairments to executive deficits.<sup>25,26</sup> Studies also show that mood (depression) and cognitive fatigue have an effect on language performance and should thus be taken into consideration when assessing language in MS.<sup>25,26</sup> It has also been suggested that communication breakdowns in MS, especially in the pragmatic aspects of language, have an effect on QOL.<sup>25</sup> However, research on this topic is scarce.

#### **Diagnostic Evaluation**

Cognitive performance, including language, should be evaluated in the early phase of the disease. Cognitive performance can be evaluated by using questionnaires (eg, the Multiple Sclerosis Neuropsychological Questionnaire, the Brief Repeatable Battery of Neuropsychological Tests, and the Brief International Cognitive Assessment for MS). These questionnaires should be combined with screening for mood (eg, the Depression Scale and the 21-item Beck Depression Inventory) and fatigue (eg, the Fatigue Severity Scale or the Fatigue Scale for Motor and Cognitive Functions). In addition, specific language tests are recommended: verbal fluency (eg, the Controlled Oral Word Association Test or Word-List Generation), naming (eg, the Boston Naming Test), and pragmatic tests (eg, inferential tasks or the Assessment of Pragmatic Abilities and Cognitive Substrates). In addition, it is strongly recommended to evaluate spontaneous speech elicited, for example, by picture materials or questions. These can be analyzed by looking at fluency measures, such as total number of words and length of sentences.<sup>25,26</sup>

#### **Treatment**

There is no definitive evidence supporting the efficacy of medications prescribed for dementia on cognitive deficits in MS. However, medication affecting the course

of the disease can slow the presentation and progress of cognitive symptoms. There is also evidence that neuropsychological training can enhance cognitive performance, especially if the cognitive deficits are mild.<sup>23</sup> With greater cognitive deficits, adaptive rehabilitation to change behavior to facilitate functioning in everyday life can be beneficial.<sup>23</sup> High cognitive reserve has been shown to protect against cognitive deficits, and, thus, being cognitively active may prevent or slow the presentation and progress of cognitive as well as language deficits in MS.<sup>27</sup> Very little is known about specific treatments of cognitive communication problems in MS.

#### **Implications for Clinical Practice**

Language deficits in MS are often linked to general cognitive deficits, especially executive deficits. Also, language impairments seem to be affected by mood and fatigue. Language deficits in MS are most typically deficits in verbal fluency and naming, but there are also problems in pragmatic language use. Thus, language evaluation in MS should include cognitive tests assessing executive functions, as well as assessing mood and fatigue because these may affect language performance. As for language specifically, it is recommended to assess naming and verbal fluency and spontaneous speech to investigate possible pragmatic deficits. When choosing tests, however, it is important to note that language deficits may be dependent on the tests used.<sup>24</sup> The literature is scarce on cognitive communication rehabilitation in MS, but some guidelines can be taken from neuropsychological rehabilitation in general. Different types of memory treatment have been shown to improve memory and QOL.<sup>23</sup> Education of the patient's family and caretakers helps improve communication with the person with MS. Also, adaptive rehabilitation, for example, training to use augmentative and alternative communication methods, can improve the QOL in persons with MS.<sup>23</sup>

#### **Current Developments and Future Perspectives**

Carotenuto et al<sup>25</sup> found that almost 55% of persons with MS have pragmatic disorders. Moreover,

## **PRACTICE POINTS**

- Communication and deglutition are basic necessities of life that are frequently impaired in MS. For this reason, clinicians need to draw more attention to disorders in these necessities.
- There is extreme variability in the manifestations of dysphagia and communication disorders in MS.
- Use the International Classification of Functioning for an individual approach to the consequences of these disorders on daily life.

they described an association between pragmatic deficit and functional connectivity of the bilateral Geschwind area based on functional magnetic resonance imaging. Although disturbed high-level language abilities and pragmatic disorders, that is, problems of language use such as understanding metaphors and irony, are fully recognized from clinical practice, studies on the issue are still limited. The limited availability of shared diagnostic tests is one of the key limitations both in clinical work and for research. Thus, the development of diagnostic tests for higher-level language is needed. A promising tool is the Italian Assessment of Pragmatic Abilities and Cognitive Substrates test, which assesses comprehension and production of figurative language. Moreover, to improve the pragmatic abilities of persons with MS, pragmatic treatments need to be developed.

### Conclusion

There is a lack of evidence in the diagnostics and treatment of dysphagia and communication disorders in MS. Knowledge development is needed through executing more and higher-quality research into the effectiveness of interventions on MS symptoms as well as on QOL. Evidence from other neurologic diseases can be used but with caution, keeping in mind MS-specific symptoms such as fatigue and cognitive dysfunction. There is no one standard way to diagnose or treat swallowing or communication disorders in persons with MS because the disease manifests differently in each person. Hence, the clinician should look at the individual and their abilities. Treatment should have an effect on activities and participation. Because MS affects various symptom domains, health care professionals should always use a multidisciplinary approach. In our opinion, it is not important which discipline works with communication problems and dysphagia in MS as long as there is attention to these areas and the health care professional has expertise in diagnosing and treating communication and swallowing disorders and works on the interdisciplinary team. Depending on the country, the expertise of communication and swallowing lies with different health professionals, although most often with the speech and language therapist. □

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