Athauda C.M.

DIFFERENTIAL LANGUAGE DEFICITS: TRAUMA INDUCED APHASIA

Tutor: senior lecturer Grigorian A.L.
Department of Normal Physiology
Belarusian State Medical University, Minsk

Aphasia is acquired language impairment caused by damage to the dominant cerebral hemispheres, typically the left hemisphere, speech-processing regions. While stroke is one of the most frequent causes of aphasia, it may also be a result of traumatic brain injury (TBI), by directly affecting the cortical language centres (Le et al, 2024).

The core cortical centres that regulate language are the Broca's and Wernicke's areas. The Broca's area, located in the inferior frontal gyrus, is responsible for the motor implementation of expressive language and sentence formation, the Wernicke's area, located in the posterior superior temporal gyrus, is responsible for the comprehension.

Though a traumatic injury to the Broca's area would not affect the patient's capability for auditory comprehension, it would classically lead to the production of non-fluent, effortful speech, often characterized as telegraphic, a syndrome known as expressive or motor aphasia. In contrast, a lesion in the Wernicke's would yield fluent nevertheless meaningless speech, accompanied with severe paraphasia and impaired comprehension (Acharya *et al.*, 2024).

In case of damage to the Wernicke's area, typically both reading and writing abilities are similarly affected. However, if the damage is to the Broca's area, only spoken language is largely affected and reading and auditory comprehension remains relatively preserved, though writing may also mirror the telegraphic quality of speech (Le *et al.*, 2024).

Conduction aphasia, which is a result of trauma to the arcuate fasciculus or cortical area, presents with isolated deficits, and recent advances in neuroimaging, suggests that conduction aphasia may be a result a parietotempoal disconnection syndrome impacting the cortical area rather than a white matter disconnection (Vallila-Rohter, 2025).

Developments in neuroimaging has allowed to visualize how focal trauma to these cortical areas produce distinct aphasic syndromes. Advanced MRI techniques, particularly diffusion tensor imaging (DTI) and functional MRI (fMRI), have enable the precise mapping of possible lesions within the Broca's and Wernicke's areas (Vallila-Rohter, 2025).

It is crucial to localize the site of the impairment via language assessments, such as Boston Diagnostic Aphasia Examination or Western Aphasia Battery, or neuroimaging to distinguish between the types and cause of aphasia.

Longitudinal MRI studies in moderate to severe traumatic brain injuries demonstrate that cortical thickness changes in the left pars opercularis (part of the Broca's area) and left superior temporal sulcus (Wernicke's area) associate with improved verbal fluency over 6-12 months, evidence of neural plasticity. Partial recovery is possible through cortical reorganization in perilesional and contralateral regions (Le et al, 2024).

Therefore, speech-language rehabilitation plays a major role in the management of specific receptive and expressive deficits, particularly when the rehabilitation strategies are personalized according to the neuroimaging of the individual lesion characteristics and learning phenotypes. This represents the future for treating traumatic aphasia (Vallila-Rohter, 2025).

For Broca's aphasia, treatments typically include melodic intonation therapy and constraint-induced language therapy, while for Wernicke's aphasia, semantic cueing and structured conversational coaching is used (Le et al, 2024). Furthermore, even sentence comprehension deficits differ by aphasia types; Broca's aphasia is associated with a far greater number of syntactic errors in comparison to Wernicke's conduction or anomic aphasia.