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BRAIN DISEASES AND SPEECH LOSS

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Abstract
The article summarizes information about brain diseases and problems of speech loss. Its purpose is to study the causes of speech delay, impairment and loss due to various types of diseases and to explain its main causes. The article is intended for students studying at the bachelor's and master's levels.

Keywords: Brain diseases, strokes, brain tumors, aphasia, language, dysarthria, motor speech, communication methods, injuries, tumors, neurological diseases: Alzheimer's disease and multiple sclerosis.

Introduction

At the end of the 20th century, a new discipline emerged – neuropsycholinguistics, which united the fields of neurobiology, psychology and linguistics. Neuropsycholinguistics, formed in three disciplines, began to conduct a scientific discussion around the linguistic abilities of a person. The object of study of neuropsycholinguistics is brain activity, mental state, consciousness and thinking of a linguistic personality. The formation of this science as a scientific and practical science is associated with the development of neurology and neurolinguistics, on the one hand, and psychology and psycholinguistics, on the other. In order to study neuropsycholinguistics well, a high level of knowledge, skills and abilities in all three disciplines is required – at the level of a neurologist, psychologist and linguist. Brain diseases like strokes, traumatic brain injuries, brain tumors, and degenerative conditions can cause speech loss through aphasia, a language disorder, or dysarthria, a motor speech disorder. Aphasia affects the ability to understand or express language, while dysarthria results in slurred or slow speech due to muscle control issues. Treatments often include addressing the underlying cause, as well

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as speech and language therapy to regain or develop new communication methods. Loss of speech due to brain disease is most often called aphasia, which occurs when the speech centers in the cerebral cortex are damaged. The main causes are strokes, injuries, tumors, and neurological diseases such as Alzheimer's disease or multiple sclerosis. For an accurate diagnosis and treatment, including working with a speech therapist, you need to see a doctor who may prescribe an MRI or CT scan of the brain.

Congenital brain disorders: hydrocephalus; encephalopathy; including anencephaly. The term hydrocephalus comes from the Greek word, with hydro meaning water and cephalus meaning head. A sudden increase in fluid in the brain is called hydrocephalus. Excess cerebrospinal fluid in the brain indicates hydrocephalus. If a young child develops hydrocephalus, his head will become larger. This disease is characterized by excessive accumulation of cerebrospinal fluid in the ventricular system of the brain. Occlusive hydrocephalus develops as a result of difficulty in the passage of fluid from the site of accumulation (cranial ventricles) to the site of absorption into the vascular system, while resorptive hydrocephalus develops as a result of impaired absorption[1].

Main part.

The mechanisms that lead to hydrocephalus are based on disturbances in the ventricular system of the brain. The ventricular system consists of four cavities (i.e., ventricles), which are connected to each other by channels. Cerebrospinal fluid is a clear fluid produced by vascular tissue located in the ventricles. Cerebrospinal fluid has several functions. These include cushioning the brain and protecting it from shock. It supplies nutrients, helps regulate the overall activity of the central nervous system, removes waste products, and delivers essential biochemicals.

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Hydrocephalus can be congenital or acquired, and somatic disorders at various stages of development can also cause hydrocephalus. Thus, hydrocephalus is not considered a single, specific entity of the disease. Symptoms of the disease:

- Excessive changes in the intracerebral fluid cause secondary symptoms of increased intracranial pressure;
- Age-related factors can also cause the disease. The pressure of intracerebral fluid in infants differs from that in adults, and the sutures connecting the bones of the skull are not yet closed, allowing them to expand to accommodate the growing intracerebral fluid.

Obstructive hydrocephalus is responsible for the onset and progression of the disease. In obstructive hydrocephalus, blockage of cerebrospinal fluid flow occurs within the ventricular system. Many conditions associated with neural tube defects, including spina bifida, are linked to obstructive hydrocephalus.

In addition, obstructive hydrocephalus can be caused by brain tumors, especially those in the brainstem, tumors of the spinal canal, and stenosis of the aqueduct - a narrowing of the canal connecting the third and fourth ventricles. Hydrocephalus occurs when there is an obstruction to the flow of cerebrospinal fluid, or when cerebrospinal fluid accumulates due to increased production or decreased absorption.

Encephalopathy (from the Greek enkephalos – brain, pathos – disease or suffering) is a general term for brain diseases that occur without inflammation. Encephalopathy can be congenital or acquired. In encephalopathy, dystrophic changes in brain tissue occur. General symptoms of encephalopathy include memory loss, impaired consciousness, headache, dizziness, and depression.

In depression, speech may be slowed or blocked. Patients suffering from such symptoms mainly experience nervousness, anxiety, weakness, and insomnia. Dystrophy (from dys – disorder, and the Greek trophē – food, nutrition) is the pathomorphological and pathophysiological manifestation of metabolic disorders in cells and tissues.

Anencephaly (from the Greek an – without, enkephalos – brain) is a partial or complete absence of the cerebral hemispheres and overlying soft tissues due to underdevelopment of the fetus in the womb. This condition can occur as a result of infectious diseases, exposure to toxic substances, alcohol, or harmful environmental effects. Other factors that damage the brain include specific and non-specific inflammations; post-traumatic diseases; tuberculosis and infectious meningitis; ischemic and hemorrhagic stroke; neurodegenerative diseases such as Alzheimer's disease; tumors; hemorrhages; and various other disorders.

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There are seven speech centers in the brain. These centers develop and mature until about the age of seven.[2] For example, stuttering is common in children under seven years of age. If a child develops stuttering due to fear, he will be examined by a teacher-psychologist and a speech therapist. If a child develops speech disorders due to brain diseases (such as oligophrenia) or as a result of craniocerebral trauma, he will be treated by a neurologist or a medical psychologist.[3]

There are five main centers in the forehead area. [4]

- movement analyzer – evaluates the correctness and errors of movement; - motor-speech center – speech articulation, controls the speech implementation of thought and consciousness within consciousness, determines its logical place;
- the center of rotation of the head and body – reacts to situations related to the ability to observe, understand, remember, distinguish, and comprehend;
- the writing center – controls thinking and cognition, memory and perception, and the concentration of thoughts;
- the center of control of coordination of movements – ensures the regulation of human actions at a normative level and makes decisions. It also controls whether the implementation of the decision is important or not.

Speech changes when the cerebellum is damaged. At the same time, the patient's speech remains fluent and smooth, but each word is divided into syllables. Not only the necessary syllables in words, but all syllables receive stress. This is called scanned speech. When the cerebellum is damaged, coordination and balance of movements are disrupted, muscle hypotonia develops, and synergistic movements become impossible.

If the cerebellar hemisphere is damaged, the patient will fall to the affected side, because each hemisphere of the cerebellum is responsible for coordination on its own side. When walking, such a patient deviates to the affected side. This is called dynamic ataxia.

Ataxia (from the Greek ataxia – disorder of order, lack of coordination) is a movement coordination disorder. It causes changes in balance during movement. Unsteadiness in a standing position is called static ataxia, and unsteadiness when walking is called dynamic ataxia. In order not to fall, the patient takes large steps,

[2] Stephen J. Falchek, Hydrocéphalie. MD, Nemours/Alfred I. du Pont Hospital for Children Dernière révision totale déc. 2018| Dernière modification du contenu déc. 2018
[3] Ибодуллаев З. Асаб касалликлари. Ўкув қўлланма. Фан ва технология . 2013. ISBN: 978-9943-10-979-7
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spreads his arms out to the sides, and tries to grab the wall. Sometimes he sways to the right, sometimes to the left. This situation resembles the way a drunk person walks. The patient is examined in a standing or sitting position. To do this, the subject stretches both arms forward. The finger–nose test, diadochokinesis, and heel-knee test become impossible.

Scanned speech. The cerebellum is responsible for coordinating the muscles that provide speech function. Therefore, it ensures the smooth articulation of vowels and consonants. When the cerebellum is damaged, the fluency and smoothness of speech are lost, and pronunciation is impaired. This condition is called slurred or scanning speech. To visualize scanned speech, imagine a drunk person speaking in front of you, or try to imitate it by putting a walnut in your mouth.

Mood swings. Due to loss of finger coordination, the patient's behavior is disturbed, and he writes in large, distorted capital letters. This condition is called megalographia.

Aphasia is a speech disorder, and its symptoms are as follows:

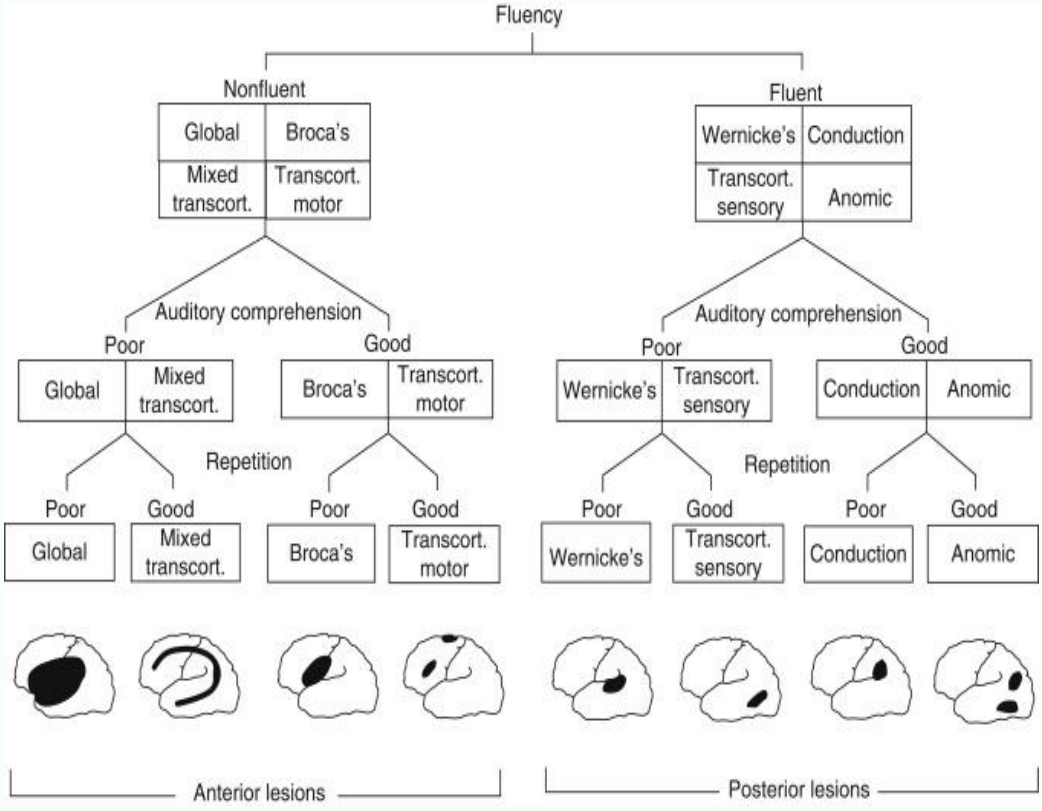

Figure 1. Symptoms of Aphasia speech disorder

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Aphasia is a language and communication disorder that causes problems with speaking, understanding, reading, or writing. The main types of aphasia include Broca's aphasia (difficulty producing fluent speech), Wernicke's aphasia (impaired understanding of speech), and global aphasia (severe difficulties with both speech and comprehension). Aphasia results from damage to established language systems following a stroke, traumatic brain injury, or other non-traumatic brain injuries (e.g., brain infection) that alter the structure and/or function of language centers in the brain or the connections between those centers. (Progressive aphasias are not addressed directly in this chapter.) Aphasia is most frequently associated with cerebrovascular damage involving the primary supplier of blood to the perisylvian language regions, the left middle cerebral artery.

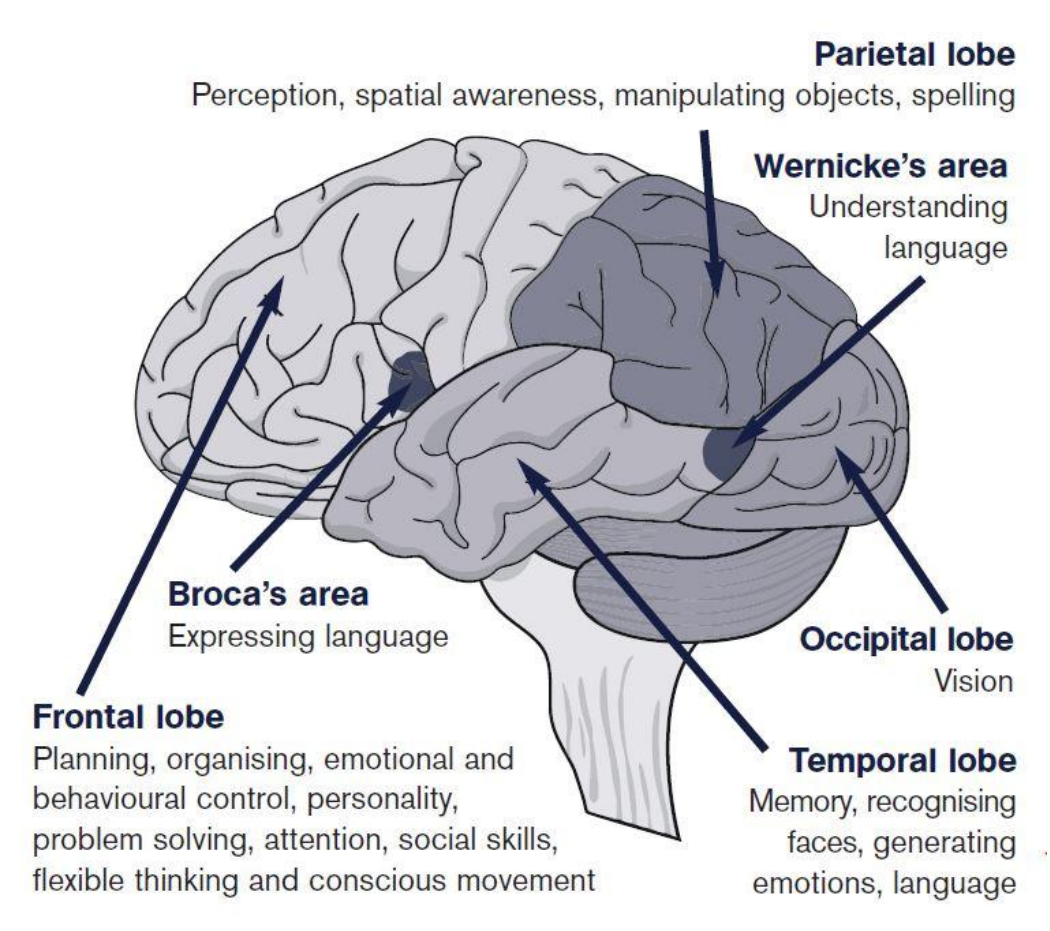

Figure 2. Aphasia and parts of the brain affected.

The main types of speech disorders include motor (expressive) aphasia, which is an impaired ability to produce speech; sensory (receptive) aphasia, which is an

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impaired ability to understand speech; amnestic aphasia, characterized by difficulty recalling words and disturbances in the nominative function of speech; and semantic aphasia, which involves difficulty understanding complex sentence structures and logical relations between words. Dysarthria (dys – disorder, Greek arthroo – I articulate) is another disorder, manifested as unclear, slurred, or booming speech due to impaired function of the muscles involved in sound formation. Slurred speech can also occur as a general impairment of articulation and clarity. Mutism is the complete or partial absence of speech; in some cases, the patient may shout out words or sentences that cannot be understood.

Frontal lobes. 1. Function: conscious thought, concentration, perseverance, judgment, attention span, impulse control, self-monitoring and supervision, problem solving, organization, critical thinking, forward thinking, ability to feel and express emotion, empathy, and memory for habits and motor activities. 2. Observed dysfunction: paralysis, difficulty in sequencing (inability to plan a sequence of complex movements needed to complete multi-step tasks), loss of spontaneity in interacting with others, loss of flexibility in thinking, perseveration (persistence of a single thought), difficulty attending (inability to focus on a task), and emotional lability (sudden mood changes).

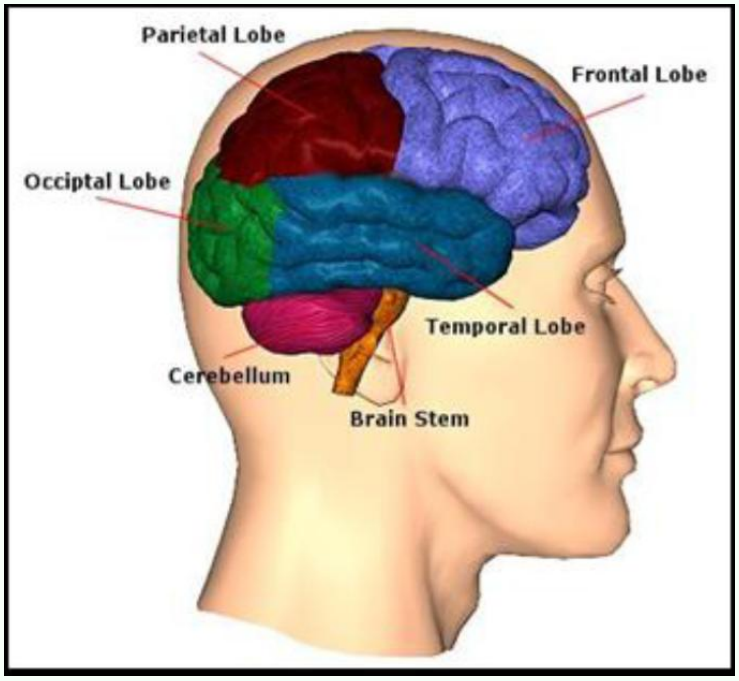

Figure 3. Brain parts

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Parietal lobes

Function: visual attention, touch perception, monitoring sensation and body position, control of reading, face recognition, understanding of time, goal-directed voluntary movements, manipulation of objects, anomia (inability to name an object), agraphia (inability to locate the words for writing), alexia (reading difficulties), difficulty drawing, and difficulty in distinguishing left from right. Observed dysfunction: inability to attend to more than one object at a time, anomia (inability to name an object), agraphia (inability to locate the words for writing), alexia (reading difficulties), difficulty drawing, difficulty in distinguishing left from right, dyscalculia (difficulty with mathematics), apraxia (lack of awareness of certain body parts and/or surrounding space), inability to focus visual attention, and difficulties with hand-eye coordination.

Occipital lobes. Function: receiving visual information and interpreting color, shape, and distance. Observed dysfunction: visual field deficits, difficulty locating objects, color agnosia (difficulty identifying color), production of hallucinations, visual illusions, inability to recognize words (word blindness), difficulty recognizing drawn objects, movement agnosia (inability to recognize the movement of an object), and difficulty reading and writing.

Temporal lobes. Function: memory and new learning, receiving auditory messages, understanding spoken language and rhythm, controlling how things are ordered and categorized, and some aspects of visual perception. Observed dysfunction: prosopagnosia (difficulty recognizing faces), Wernicke's aphasia (difficulty understanding spoken words), disturbance of selective attention to what is seen and heard, difficulty with identification of objects and verbs, increased or decreased interest in sexual behavior, inability to categorize objects, persistent talking (often with right lobe damage), and increased aggressive behavior.

Brain stem. Function: breathing, heart rate, swallowing, startle response (reflexes to visual and auditory stimuli), autonomic nervous system functions (sweating, blood pressure, digestion, temperature regulation), level of alertness, ability to sleep, and vestibular function (sense of balance). Observed dysfunction: decreased vital capacity, dysphagia (difficulty swallowing), problems with balance and

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movement, vertigo (dizziness and nausea), insomnia, and sleep apnea (breathing difficulties during sleep).

Cerebellum. Function: coordination, balance, and equilibrium. Observed dysfunction: asynergia (loss of coordination of motor movements), dysmetria (inability to judge distance and when to stop), adiadochokinesia (inability to perform rapid alternating movements), intention tremor, abnormal or ataxic gait (staggering, wide-based walking), tendency to fall, hypotonia (weak muscles), dysarthria or dysphonia (slurred or impaired speech), nystagmus (abnormal eye movements), and loss of the ability to coordinate fine movements.[5]

Conclusion

The patient bends his legs and arms, brings them close to the body, and sits quietly for a long time without talking; this condition is called mutism. Slurred speech may also occur, in which fluency and smoothness of speech are lost and pronunciation is impaired. The appearance of such disorders as stuttering is also emphasized. In addition, in severe forms of aphasia, astasia (inability to stand) may be observed in the state and balance of the body, abasia (inability to walk), atony (loss of tone or vital activity of the body or its part), debalance (imbalance of the body), and megalographia (changes in handwriting).

In every developing society, the issues of speech loss due to cerebral palsy and various injuries are one of the global problems of state importance. In order to return a person to a normal life as a person, it is first of all very important to clarify the types and causes of the disease. In this responsible work, not only a neurologically educated person, but also a psychologist and a linguist are equal participants. In the article, we considered it appropriate to dwell on the essence of these issues.

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