# Brain and Its Vital Functions

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The brain is the integral organism and all its parts are vitally necessary for proper functioning of human body. The parts of the brain are interconnected and damage of one of them reflects on the functioning of the other parts. But if I were to choose which part of the brain I would give up without suffering disastrous losses to integrity and health of my organism, I would choose epithalamus. Epithalamus is the part of the diencephalons together with 3 others – thalamus, ventral thalamus, or subthalamus, and hypothalamus. Epithalamus is represented by the pineal gland situated in the midline posterior and dorsal to the third ventricle. This part of the brain is responsible for synthesizing melatonin and enzymes, which are sensitive to diurnal light. Rhythmic changes in its activity in response to cyclical input suggest that the gland serves as a biological clock. Thus, the main function of this part of the brain is responsibility for biorhythms. In case of damage, the person loses sense of time. It seems to me one of the least possible losses that the person can suffer in case of damage of the brain, especially compared to consequences of other injuries of the brain (Farr, 2002).

Since there are 119 coronal sections in the human brain (Carver, 1998), it would take long to describe all the effects of malfunctioning of each part. Therefore, suffice it to mention some parts of the brain that are very important for the appropriate functioning of the human nerve system.

The first part, I would like to mention, is frontal lobe. Frontal lobe is the largest part of all lobes of the brain situated rostral to the central sulcus (towards the nose from the sulcus). The precentral gyrus, located rostral to the central sulcus, constitutes the primary motor region of the brain; when parts of this gyrus are given electrical stimulation in conscious patients (operated upon under local anesthesia), they produce localized movements on the opposite side of the body that are interpreted by the patients as voluntary. Injury to parts of this gyrus results in paralysis on the contralateral (opposite) half of the body. Thus, frontal lobe is a primary motor area of the nerve system. This large system provides

coordinating and controlling influences resulting in appropriate sequence, force, direction and manner of voluntary motor activities. There is another very important part of the inferior frontal lobe, situated close to the lateral sulcus, called Broca's area. This is an area concerned with neural mechanisms which convert thoughts into speech. Thus, frontal lobe is a very important part of the human brain, responsible for movements and coordination of motor activities as well as some abilities of speech production and damage of this part would bring grave consequence to the general functioning of the organism.

Another very important part of brain is thalamus. The thalamus has been considered for a long time as the key element to understanding the organization of the central nervous system. It participates in the distribution and relay of most, though not all, sensory and motor signals to specific regions of the cerebral cortex. Sensory signals generated in all types of receptors are projected by complex pathways to specific relay nuclei in the thalamus, where they are segregated and systematically organized. The relay nuclei in turn supply the primary and secondary sensory areas of the cerebral cortex. Sensory input to thalamic nuclei is crossed for the somesthetic and visual systems, bilateral for the auditory system, and ipsilateral (on the same side) for gustatory (that is taste) and olfactory (smell) sense (Kornhuber, 1973).

The somesthetic relay nuclei of the thalamus, collectively known as the ventrobasal complex, receive signals from the medial lemniscus, originating in the medulla, from spinothalamic tracts, and from the trigeminal nerve. This segregation of deep and superficial sensation is preserved in projections of the ventrobasal complex to the primary somesthetic area of the cerebral cortex (Carver, 1998).

Thus, thalamus is a control center of all kinds of sensitivity. It plays the role of integral, processing, and switching center for all sensor information. Besides, thalamus integrates information from certain parts of the cerebral cortex and it participates in the

production of feelings of pain and pleasure. Moreover, this part of the brain is also responsible, together with others, for the memory. Thus, thalamus is regarded as a gate for accession of afferent impulses from all systems of the organism to cerebral system.

Therefore, losing this part of the brain would be crucially grave for the functioning of the organism.

Another important part responsible for other functions is amygdala. This almond-shaped part of the brain is in control of human aggression and emotions. Dysfunction of amygdale is called autism. Many individuals suffering from such disease are aggressive towards themselves and other people, or on the opposite are extremely passive. According to D. Dennett (1996), very often autistic individuals appear emotionless or flat, even though, they obviously do have emotions. Experimenters have also shown that when the amygdala is removed or damaged, animals exhibit behaviors similar to autistic individuals, such as social withdrawal, compulsive behaviors, failure to learn about dangerous situations, difficulty retrieving information from the memory, and difficulty adjusting to novel events or situations. In addition, the amygdala is responsive to a variety of sensory stimuli, such as sounds, sights, and smells; as well as emotionally or fear-related stimuli. Autists often have problems with each or any of these senses. I consider the emotional side being important part of human functioning, which is essential for valuable existence of humans.

One more extremely important cerebral organ is Cerebellum. The cerebellum is the second largest part of the brain, after the cerebrum. It is responsible for muscle coordination and maintaining of normal muscle tone and posture. The cerebellum coordinates balance. Thus, this part of the brain functions as a computer, providing a fast and clear response to any set of sensory signals. It plays no role in sensory perception, but it influences profoundly on equilibrium, muscle tone, and the coordination of voluntary motor function. Although, a cycle of simple repetitive movements can be organized without sensory feedback, more

sophisticated movements require feedback as well as what is called feed-forward control.

Cerebellum is the organ that provides such feedback and control. Many parts of the brain have to be kept informed of movements being carried out in order to detect error and continually correct the movement. The cerebellum permanently receives signals from the trunk, limbs, eyes, ears, and vestibular apparatus, maintaining in turn a continuous transfer of information to the motor parts of the thalamus and to the cerebral cortex. As a movement is being prepared, a replica of the instructions is sent to the cerebellum; the cerebellum sends back its own information to the cortex. The cortex, meanwhile, sends information about the movement to various afferent neurons that are about to receive information from receptors in the body parts, where the movement is about to begin. This comparison between instructions sent and movement performed is a fundamental requirement of all complicated movements. Cerebellum is the principal part accountable for this comparison. The discharge of impulses from motor to sensory regions is called the corollary discharge (Kornhuber, 1973). Kornhuber (1973) describes this mechanism in his work in detail. The mechanisms involving the cerebellum do not come to consciousness. There are no sensory consequences of damage to the cerebellum, for the cerebellum is a motor structure. But, when the cerebellum is damaged or degenerates, any error between the movement being performed and the efferent copy will no longer be corrected, and the postural adjustments sent from the cerebral hemispheres will no longer be implemented. The force and extent of movements also will be abnormal, the movement going too far or not far enough. The various muscles may not come into play at the right time, and there will be a disturbance in the relationship of antagonist muscles, so that the accurate arrival on target will be replaced by oscillation. Therefore, cerebellum is a vital part of human motor system.

In this essay only some of the parts of the human brain and the effects of damage thereof were mentioned. Our brain has a big amount of these parts, 119 sections, and each of

them is very important for proper functioning of human being. These parts being interdependent and interconnected, dysfunction of one part damages the integrity of the whole mechanism. Therefore, our brain is extremely significant organ that must be kept in safety.

References

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