

On criteria for determination of brain death

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*"Man is a reed, the weakest of nature, but he is a thinking reed." -
Blaise Pascal*

Recently, medical society established a new concept on criteria for determination of human death. In the Organ Transplant Act, human death is defined as brain death.

This law is coupled with organ transplantation from brain death donors to alive patients who require healthy organs for survival. Recent advances in the field enabled physicians to transplant almost any types of organs including heart, skin, muscle, kidney, and liver except for brain. Even after the donor was gone, transplanted heart is still alive and makes beats in the recipient body whose heart was removed and stopped beating. The transplantation medicine clearly suggests that identification of individual person should depend on the brain but not the other organs including heart. Furthermore, transplantation medicine indicates that human death should be diagnosed with brain death rather than cardiopulmonary arrest. Accordingly, human death is defined as brain death in modern law.

Since brain itself is not a simple organ but a complex one, we should be careful to define precise criteria for determination of brain death. As neurologist have revealed, brain stem maintains fundamental activities necessary for life of our whole body. Thus, physiological functions of brain stem correspond to sanctity of life in bioethics. Irreversible cessation of brain stem causes lack of self-maintenance of life activities of human body such as blood circulation and respiration, resulting in death of human body unless heart beat and breath are maintained by artificial devices. If bioethics consider sanctity of life as the primary concern, irreversible cessation of brain stem functions should be considered as criteria of the brain death for determination of human death.

Limbic system gives us emotion, passion, and willingness, which are necessary for improvement of our quality of life in corporation with recognition and memory of cerebral cortex. Physiological functions of limbic system correspond to quality of life of human beings in bioethics. Irreversible cessation of limbic system causes loss of emotions such

as love and grief, resulting in life as vegetable. If bioethics consider quality of life as the primary concern, irreversible cessation of limbic system functions may be considered as criteria of the brain death for determination of human death.

Cerebrum could recognize the world not only in our body but also in the whole cosmos. Physiological functions of cerebrum correspond to dignity of humanity in bioethics. Irreversible cessation of cerebrum loses consciousness, recognition, memory, reasoning, meditation, and revelation. If bioethics consider dignity of humanity as the primary concern, irreversible cessation of cerebrum functions might be considered as criteria of brain death for determination of human death.

Modern science defines brain as an organ of mind, which should stand on the body mind monism. From this point of view, our mind is exactly the functions of physiological activity of brain, which is a highly sophisticated organ evolved and developed in living things. Especially, one might consider the brain as a messenger from the whole world because of its capability to recognize the world for revelation. Cerebral cortex is the place where human could communicate with the world. Cerebral cortex keeps developing through entire human life. Moreover, neural connectivity in the cerebral cortex is so plastic that human can change their understanding and behavior by learning and memory. Since neural connectivity in cerebral cortex establishes identity and personality of individuals, its diversity should not be discriminated but respected as diversity of personality in human society. Even if losing some functions of cerebral cortex by stroke for example, the patients keep their consciousness, identity, personality, and humanity for the rest of life, which should be respected.

Since function of brain affects not only the sanctity of life but also quality of life and dignity of humanity, it is necessary to take account of social, ethical, and religious conditions for making law of organ transplantation from donor with brain death. I hope that research and development of neuroscience, neurology, and psychiatry in brain function improve our understanding on relationship between body and mind to establish unambiguous criteria for determination of brain death in near future.

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