

Brain Death

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Diagnosis of brain death has always been a difficult decision. Various countries have different diagnostic protocols and legislative requisites. With escalation in incidence of head injuries in recent decades, there will be more and more patients, on ventilatory support, with no real chance of ever regaining consciousness. Clinicians will

be required to make these decisions more frequently. Probably the criteria will always be different in countries all over the world. In Pakistan we need to develop a protocol and have it cleared through the legislative process. A "Fatwa" is also needed from the Ulema in Pakistan as is also being practiced in Egypt and Saudi Arabia.

The dilemma of brain death

The lack of reliable criterion for distinguishing actual from apparent death, caused a universal concern that death might be declared prematurely. Indeed, in previous centuries this fear was not unfounded¹. Montgomery in 1896 while writing reports on the condition of bodies removed from a military cemetery remarked that nearly 2% of the exhumed bodies were no doubt, victims of suspended animation². Similarly in 1967 an American soldier who was declared dead showed signs of life as he was about to be embalmed³. In 1905 a pamphlet was published with the title "Burying Alive"⁴. In this instance a 35 years old man suffering from scarlet fever was buried 48 hours after he was declared dead. When his coffin was removed 2 months later, the glass front was found to be shattered, the bottom kicked out and the glass sides sprung. The body was reported to lay face downwards with the arms bent and in the clenched fists were handfuls of hair⁴.

However before the introduction of the techniques of artificial respiration the diagnosis of death was generally a straightforward affair⁵. A patient was dead once the vital functions of respiration and circulation had ceased. It has now become commonplace for the hospitals to have deeply comatose and unresponsive patients with severe brain damage, who are maintained on artificial respiration. With the ability to maintain these functions artificially, the dilemma is when to switch off the ventilator to declare a patient dead so that his organs could be used for transplantation. Continuation of mechanical ventilation after the brain is dead, raises false hopes of the relatives. It greatly adds to the burden on the nursing staff expected to maintain the highest standards of technical and nursing care, and significantly adds to the cost of treatment. Considering centuries old fear of incorrect diagnosis of death and premature burial, it is remarkable that during a mere two decades the world's society could accept such sweeping social, philosophical and legal changes as to even consider the diagnosis of death of a person by death of a single organ i.e., the brain⁵. The question has arisen whether destruction of the hemispheres or cerebral cortex in a person with preserved

respiratory and vasomotor functions could be considered adequate evidence to declare him clinically or legally dead. Some argue that cortical death alone is not sufficient to deprive a person of his right to live⁶, as some psychic activity may be present in the brainstem. To others a vegetative state after the total destruction of cerebral hemispheres is like no life at all⁷. This was the case of Karen Quinl, a 21 years old girl, who was in a "chronic, persistent, vegetative state, and no longer had any cognitive functions"⁸. Cerebral death implies total and permanent abolition of brain functions so that both volitional and higher level reflex activity and response are lost. This was best summarized in a statement attributed to Justice Holmes in which he said "To live is to function; that is all there is to living"⁸.

Legal aspects

Prior to the evolution of the concept of cerebral death, the courts of the United States were applying the definition of death from Black's law dictionary⁹, which was "the cessation of life": the ceasing to exist; defined by physicians as a total stoppage of the circulation of the blood, and a cessation of the animal and vital functions consequent thereupon such as respiration, pulsation etc¹⁰. Gradually over several years the concept of cerebral or brain death as representing the actual death of the individual came to be supported in a number of courts and judicial forums^{11,12,13}.

The legal ramifications of defining death are many. For example a patient may be regarded dead for the purposes of organ transplantation but alive for inheritance or estate taxes. It is to solve these problems that codes of practice such as Harvard criteria¹⁴ were devised to guide medical practitioners in the diagnosis of brain death. These have been refined with increase in knowledge. In December 1974 the House of delegates of American Medical Association supported the concept of cerebral death but opposed statutory definitions and resolved to reaffirm established policies. It resolved that "At first statutory definition of death is neither desirable nor necessary". That, "State Medical Associations urge their respective legislatures to

postpone enactment of legislation defining death by statute". That "death shall be determined by the clinical judgment of the physicians using the necessary available and current accepted criteria" and "Permanent and irreversible cessation of function of the brain constitutes one of the various criteria which can be used in the medical diagnosis of death"¹⁰. In October 1976 the Conference of Medical Royal Colleges and their Faculties in the UK, issued criteria by which the diagnosis of brainstem death could be made accurately, thus enabling doctors to discontinue mechanical ventilation in the certain knowledge, that recovery would not have been possible¹⁵.

The difference in philosophies of the various nations and societies was shown in the 1976 meetings of the neurotraumatology committee of the World Federation of Neurological Societies¹⁴. Of 27 countries, concept of cerebral death was accepted medically by 20, legally by 5, and 5 countries (Egypt, India, Scandinavia, Spain and Japan) did not accept both medically and legally. At this meeting two major views were put forth. One view was, that the criteria for brain death should be based upon clinical considerations with little or no laboratory confirmation that could be used by all physicians regardless of their neurological expertise. The other view was that clinical criteria were inadequate and laboratory tests were needed to confirm the diagnosis and that the diagnosis of cerebral death could be made only in centres equipped with these laboratory studies and by individuals who were adequately trained to interpret and correlate them with the patient's neurological status. This latter approach would not be an impediment to organ transplantation, since organs are transplanted in well equipped hospitals. However it is questionable whether to continue costly and needless support of a hopelessly ill patient in smaller and less well equipped hospitals. Indeed, the need for the determination of death arises much more often for economic and humanitarian reasons involving the patient and his family than it is for organ transplantation. A President's Commission¹⁶ was constituted in the same context to study the ethical problems in medicine, biomedical and behavior research. A report of the medical consultants was published in 1981 which gave guidelines for determination of the brain death. The generally accepted and practiced criteria of brain death are as follows;

- A. Cerebral inactivity; confirmed by isoelectric electroencephalogram, cessation of cerebral blood flow on cerebral angiography, radionuclide angiography (CRAG), echoencephalography, CT, MRI or a PET scan.
- B. Absence of brainstem functions
- C. Positive clinical apnoea test
- D. Reduced catecholamine excretion in the urine¹⁷.
- E. TRHST - Thyrotropin releasing hormone stimulation test¹⁸.

Who Should Diagnose Brain Death

It usually is the opinion of 2 doctors clinically independent and none of them should be a member of the transplant team. One should be the doctor incharge of the patient and the other usually the incharge of the intensive care unit. In some situations it may be worthwhile to include the family physician,

who should be taken into confidence as he is of a great help. Two examinations should be carried out, interval between examinations varies according to the age of the patient, 6-24 hours interval in adults depending on the factors responsible for the patient's condition. It is commonly held that young children may be more resistant to anoxia and more likely to recover from coma than adults. Virtually the only reason brain death criteria are needed for children is for organ transplantation.

When To Switch Off The Ventilator

There can be two situations for switching off the ventilator.

- a) To declare a patient dead; one can switch off the ventilator once the brain death criteria have been established according to the accepted medical standards.
- b) Organ transplantation; When on the first examination the brain death is obvious, the relatives should be consulted and explained the whole situation. If the permission is granted by the relatives, one should wait for the second examination and once finally decided, the donor should be taken to operation theater, the organs removed and ventilator disconnected.

Discussion With Relatives

The question of organ transplantation may be raised by the family, but usually it has to come from the attending physician. This may decrease family grief by knowing that the organ transplantation permission will help another person to have an additional gift of life. The relatives should not be burdened with the decision about when to stop the respirator. Of course, they should be informed of the plans in a clear, straightforward manner. In most instances they will agree with the suggested course of action. If they disagree, then further discussion is in order and the respiratory assistance should be continued until a full understanding is reached or cardiac arrest ensues to settle the matter.

Sometimes the relatives would not accept the concept of brain death as enough evidence. Under these circumstances it may be wise to discuss with the relatives and let the patient breathe 100% air through ventilator. If blood pressure is artificially maintained, the support should be withdrawn. It usually takes 5-6 hours with air for the patient's heart to stop.

Status Of Brain Death In Pakistan

At the moment the problems of disconnecting the ventilators in comatose and unresponsive patients in Pakistan arises only for the purposes of declaring a patient dead who meets the criteria of brain death according to accepted medical standards. No transplantation has been performed in Pakistan from brain dead patients. At the moment there is no legislation to cover the legal aspect and no standard criteria evolved. Two hurdles have to be crossed before one can embark upon the brain dead organ transplantation. Firstly, a clearance of the formulated criteria by the Assembly and secondly a Fatwa by Ulema. The government should appoint a committee consisting of all the specialists concerned with transplantation, i.e; a physician, an anesthesiologist, a neurosurgeon, a cardiovascular surgeon,

urological surgeon, a chest surgeon, a general surgeon, and an eye surgeon.

Islamic Concept Of Death

It is the separation of soul from the body. When does that take place we do not know? The Holy Prophet (PBUH) was asked, What is soul? He replied soul is the Amr (order) of God and very little knowledge has been given to you about it. The soul is immortal. This was also said by Shakespeare. "Dust thou art to dust returnest", was not spoken of the soul. In summary a brain dead patient must conform to the following criteria.

There should be cerebral unresponsiveness and unreceptiveness, there should be no suspicion that the coma is due to depressant drugs, primary hypothermia, significant abnormalities of metabolic and endocrine factors should be excluded, spontaneous respiration should have ceased and proved by apnoea test, there should be no brain stem reflexes and the patient should have an untreatable brain lesion.

Although a reliable diagnosis of brain death can be made on the basis of the clinical findings and course of events in most cases, additional confirmation may be desirable in other cases, by demonstrating absence of cerebral blood flow and isoelectric EEG. Lastly, it is suggested that attempts to formalize scientific thinking in the clinical arena should be done with sensitivity and compassion.

References

1. Tebb W., and Vollum, EP.: *Premature Burial and How it may be prevented*, 2nd Ed., Hadwen, W.R., ed. London, Swan Sonnenschein & Co., Ltd., 1905.
2. Montgomery TM.: In Tebb W and Vollum EP.: *Premature Burial and How It May be prevented*. 2nd Ed., Hawden, WR., ed. London. Swan Sonnenschein & Co, Ltd., 1905, p.81.
3. News item. *Kansas City Star*. November 3, 1978, p.1.
4. Wilder A.: In Tebb W, and Vollum EP.: *Premature Burial and How It May be prevented*. 2nd Ed., Hadwen, W.R., ed. London, Swan Sonnenschein & Co., Ltd., 1905, p.82.
5. Arnold JD., Zimmerman TF and Martin DC.: Public attitudes and the diagnosis of death. *J.A.M.A.*, 206: 1949-1954, 1968.
6. Kaufner C. and Penin H.: Todeszeitbestimmung beim dissoziierten Hirntod, *Denstch. Med. Wschr.*, 93:679-686, 1968.
7. Korein J.: On cerebral, brain and systemic death. *Stroke*, 8:9-14, 1973.
8. Foster HH Jr.: Time of death. *New York J. Med.*, 76:2187-2197, 1976.
9. *Black's Law Dictionary*. 4th Ed. St. Paul, Weil Publishing Co., 1968.
10. A Definition of Irreversible coma. Report of Ad-hoc Committee of Harvard Medical School to Examine the Definition of Brain Death. *J.A.M.A.* 1968;205:85-88
11. The Moment of Death. *Medicoleg. J.*, 30:195-195, 1962
12. Renal Transplantation from mortally injured man. *Medicine and the Law*. *Lancet*, 2:294-295, 1963.
13. Walker AE.: *Cerebral Death*. Dallas, Texas. Professional Information Library, 1977.
14. Hirth HL.: Brain death. *Med. Trial Techn. Quart.*, 21:377-405, 1975
15. Conference of Medical Royal Colleges and their Faculties(UK). *Br. Med J.*, 1976, 1, 1187.
16. Report of the Medical Consultants on the Diagnosis of Death to the presidents commission for study of ethical problems in Medicine and Biomedical and Behaviour research. *Guidelines for the Determination of Death.*, *J.A.M.A.* 1981;246:2184-2186.
17. Feibel JH.: Reduced catecholamine excretion at onset of brain death. *Lancet* 1:890, 1981.
18. Imberti R, et al. Confirmation of brain death utilizing thyrotropin-releasing hormone stimulation test. *Neurosurgery* 1990;1:27:167.
19. Task Force for the Determination of Brain Death in Children: *Guidelines for the determination of brain death in children.* *Ann neurol* 21:616, 1987.