The first description of brain death was given in 1050 by two French Physicians, Mollaret and Goulon who identified this condition as “Coma depasse” literally a state beyond coma.

The concept of brain death became a legal issue and in India it was defined in 1994 in the Transplantation of Human Organ Act, which is an important landmark.

Current Status of Organ Transplant in India:

Cadaveric organ transplantation has taken off with thirteen heart transplantations performed at the AIIMS, New Delhi within a short time of the passage of the Act. A number of cadaveric kidney transplants were performed at various centres in India. There is a tremendous potential for Cadaveric donors with 48,000 fatal automobile accidents every year. AIIMS has launched the organ retrieval & banking organisation (ORBO), which is considered as a nodal coordinating agency for facilitating the task of finding donors and organising for the transplant into recipients, starting at Delhi.

The sets of criteria used to define brain death vary from country to country with a basic aim to demonstrate the absence of brain stem functions.

Brain Stem and its functions

The mid brain, pons and medulla oblongata make up the brain stem each approximately 2.5 cm in length. Brain stem is a small but a vital area of the brain responsible for the reflex control of essential functions. The reticular formation connects the midbrain, pons and medulla oblongata with each other. It comprises of network of nerve cells and fibres that also connects the brain stem with spinal cord, the thalamus and cortex. Reticular formation is responsible for the excitability of brain and inhibition of the system leads to sleep and coma.

The Brain stem directly controls wakefulness (reticular activating system) breathing (respiratory centre), and blood pressure (vasomotor centre). Passing through the brain stem are all reflexes determine intact brain stem and its functions.

Definition of Coma

Coma is a state of unconsciousness determined by the absence of any psychologically understandable response to external stimuli or inner need. The patient may appear to be asleep but is incapable of responding normally to external stimuli, however there may be eye opening, flexion or extension of muscle in the limbs and occasionally grunting or groaning in response to painful stimuli.

Definition of Brain Death: Brain death is defined as an “irreversible cessation of all functions of the entire brain including brain stem and it is characterised by apneic coma and absence of brain stem reflexes. (Pallis 1983)

The most ordinary death occurs following the cessation of respiration and heart beat, however, where brain death occurs as the primary event this sequence is reversed.

Causes of Brain Death: The conditions that can lead to brain death are:
- Severe head injury
- Acute severe metabolic insult e.g. Hypoglycemia, Cerebral hypoxia
- Acute vascular pathologies e.g. stroke, haemorrhagic or ischemic
- Acute CNS infections

Head injury and intracranial haemorrhage are the two most common conditions responsible for brain death. Jennett et al (1981) found that in 55% of patients with head injury as primary cause of brain death and 20% of the cases with intracranial bleeding were responsible for brain death.

Requisites to Brain Death:

Neurological examination to elicit brain-stem reflexes is...
the most important tool to confirm brain death. However, there are three requisites before the standard criteria to establish brain death is considered.

1. There should be no doubt that the patient’s condition resulted from irreversible brain damage of known etiology.

2. Eliminate reversible causes of coma such as hypothermia, hypoglycemia, drug intoxication and the effects of depressant drugs, e.g., muscle relaxants, sedatives, narcotics and barbiturates, potentially reversible metabolic & endocrine disturbance.

3. The patient is being maintained on a ventilator because spontaneous respiration has become inadequate or has ceased.

**Establishing Brain Death:**

Once these requisites are fulfilled, the following standard criteria to confirm brain death can be used to ensure the absence of brain-stem reflexes.

1. **Light reflex** is tested by focusing light through a torch on the pupils. Normally the pupils of both the eyes will constrict in response to light. In brain-stem damage, pupils are fixed, dilated and do not respond to sharp changes in the intensity of light.

2. **Absent Corneal reflex:** This is tested by touching the periphery of cornea with a whip of cotton, normally there is blinking of eye in response to touching the cornea. In brain death, there is absence of corneal reflex.

3. **Absent oculovestibular reflex:** This can be ascertained by raising the head to 30 degrees and instilling 50ml to 200ml of ice cold saline into an external auditory meatus after cleaning the external auditory meatus. Conscious patients will develop nystagmus with the quick phase away from the side of instillation. In brain death there will be no response.

4. **No reaction to deep painful stimuli:** The capacity for consciousness resides in the brain stem. Non-receptivity and non-responsiveness in relation to deep painful stimuli is suggestive of brain damage. Absence of deep tendon reflexes was initially included in brain death criteria, but since these reflexes are now thought to be of spinal origin, they are excluded in the diagnosis of brain death.

7. **Apnoea Test:** It can be carried out by giving 100% oxygen through respirator for 10 minutes and then 5% carbon dioxide is added to oxygen so that there is maximal stimulus for breathing. A fine catheter is passed through the nose and into the trachea where it delivers oxygen at 6 litres per minute.

The respirator is then disconnected for 10 minutes and at the same time the patient is observed for any sign of respiratory movement. If there is none, the apnoea test is positive.

It is customary to repeat the tests to ensure that there has been no observer error and it is recommended that two assessors undertake the neurological examination individually, 6 hours apart, for establishing brain death. On completion of the sets of brain stem tests the patient is legally dead, and the family should be informed of the outcome of the tests. If the family has consented for organ donation then the patient remains ventilated until the organs have been retrieved.

Nurses working in ICU should be familiar with the laws in their state related to “Brain death” and the institutional policies for determination of Brain death.
Organ & Tissue donation:
It refers to the practice of giving part of a person's body either alive or after death for transplant into another person.

Organ Transplantation:
It refers to grafting of any human organ from a living donor or human cadaver donor to a recipient with end stage organ failure.

Age limit for potential donor:
Age is not in itself a contraindication to organ donation. More important than chronological age is the current function of the organs in question such as heart, lung, liver, pancreas, kidney, GIT & bone marrow, cornea etc.

Process of Organ Transplantation:
It consists of:
A. Selection and preparation of donor
B. Selection and preparation of recipient
C. Care of recipient following transplantation

(A) Selection/Evaluation of Donor:
i) Once the potential donor is identified, it is very important to eliminate the following conditions in the donor:
- Active systemic infection such as : Tuberculosis, Viral Hepatitis, HIV/AIDS, Syphilis and Leukemia
- Any other malignant disease with potential of metastasis.
- Steroids & insulin use
- Current intravenous drug abuse

Prior to organ retrieval the following laboratory tests are done in living donor routinely and throughout the management phase:
ii) Lab-tests
Blood should be sent for the following tests.

ABO typing, Serum titre for Cytomegalovirus, Hepatitis B & C virus, HLA Tissue Typing, Toxoplasmosis, Serum Electrolytes & Serum Creatinine, Blood Urea, Sugar & Blood for culture, Liver function test, Complete blood count and coagulation studies Renal function test depending on the organ to be transplanted, other specific tests are also done to assess the functions of the organ e.g.
* For Heart Donors - X-Ray Chest, ECG, Arterial Blood gas analysis, echo & in selected case cardiac cath. & angiography.
* Urine analysis

iii) Preparation of Donor

Careful management of potential multi-organ donor is imperative so as to keep the organ viable. Nursing personnel can play a potential role in all aspects of the transplantation process. They need to have accurate upto date information regarding the progress of brain death, end-stage organ failure and immunology.

Nurses working in ICU & emergency ward can serve as a vital link in the system for identifying potential cadaveric organ donor, helping families grieve and accept the patient's death can help the relatives.
take a definitive decision about organ and give the vital consent. (2000 - AIIMS) study conducted to determine the attitude of general public towards organ donation revealed that willingness to donate organs is higher in subject to higher educational status. It concluded that the awareness needs to be created in general public regarding organ donation through mass media for this noble cause.

Following are the general guidelines which Nurses can use for the management of donor.

1. Patient should remain ventilated until the organs have been removed. Legislation applicable to a particular state should be followed.

2. Obtain consent for organ donation: The problem of getting permission for organ removal can be dreadfully difficult in the emotional and fraught situation that occurs after a lost fight to save the life of the patient. This requires effective humane communication by the doctor or Nurse. Once the patient’s family members have agreed, Nurse can obtain consent for organ donation on a specified form.

3. Assess the monitoring lines: The patient should have an arterial line, a C.V.P. line, a Foley catheter, and temperature probe. If patient is hypotensive, administer 1 to 2 litres of Ringer lactate over 30 to 60 minutes in order to maintain CVP at 12-15 cms of H2O.

4. Maintenance of haemodynamic stability:
   i. In order to maintain the organ in optimal condition, perfusion should be maintained with fluid & low dose dopamine infusion. This will keep the pressure enough to perfuse the vital organs.
   ii. Maintain I/V fluids at 100 ml hourly plus the previous hour urine output
   iii. Keep track of the input and output of fluids

5. Prevention of infection: Infection control measures and strict adherence to aseptic protocols should be followed to prevent any infection likely to harm the recipients. Nurses at bedside can make close observations and document findings, plan interventions and report these to the physician.

6. Maintenance of body temperature: In brain death, control of body temperature is lost and warming blankets and constant monitoring of temperature, is important to prevent hypothermia. Maintain body temperature above 35°C.

7. Care of the relatives: Provide psychological & physiological comfort for the family of the brain dead patient. This will make them feel proud of themselves as they have saved many lives by donating the organs of their dear ones.

8. Transfer of patient: Patient is transferred to O.T. while he is on respirator and has stable hemodynamics.

9. Surgery: Surgery is performed under fully sterile condition with excellent lighting. No anaesthesia is administered since the dead do not feel pain. Once the organs are removed, it is placed in appropriate perfusing solution.

10. Maintain the dignity of patient once the organs have been retrieved.
11. After donation, respirator is weaned off, the surviving kin gets the custody of the remains for funeral. The relatives should be provided all necessary help in procuring the body of the deceased.

(B) Selection of Recipient

i. Organ transplantation is done only to those individuals who are in end stage of organ failure with limited life expectancy.

ii. Preparation of the Recipient: It includes psychological and physical preparation.

Psychological Preparation: The patient should be explained regarding potential complications, rejection & use of the life long immunosuppressive therapy following transplantation and financial implications.

Financial Implications: Cost of transplant and patient’s ability to pay for the same needs to be explained.

1. Physical preparation - Thorough cleaning of body skin like for any other surgical procedure.
2. Test done - Include histocompatibility testing HLA (Human Leukocyte Antigen). Identical siblings has highest rate of survival. Non related persons have less chance of having identical HLA types.
3. Thorough medical history - The recipient must be afebrile if not, then transplantation is deferred till infection clears.
4. Informed consent, specifying potential complications must be obtained.
5. Recipient must receive immunosuppressive therapy prior to transplant as body never develops a natural tolerance to transplanted organ. Immuno-suppressive therapy prevents rejection, minimises the risk of infection and enhances the quality of life of recipient.

A single dose drug cannot suppress all the necessary immune responses, hence triple drug therapy comprising of following drugs is used:

Methyl Prednesolone: 5-60 mg per Kg of body wt. in divided doses.
Cyclosporine: 10- 15 mg./kg of body wt.
Immuran: 2 - 5 mg / Kg of body wt.

In case of acute rejection the drugs used are Methyl Prednesolone x 3

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