



International Consensus on Brain Death Determination

Proposal for Standards

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Brain Death Medico-ethical reasons

Brain Death is stated in patients where continuing treatment of the patient is without any hope of regaining any level of brain function. A continuation of therapeutic measures in Brain Death is neither in the interest of the patient nor ethically permissible. To treat a living corpse is unethical, it reduces a human being „to a mere collection of organs“.

Shewmon (1998).

Brain Death different terms in historical view

Mollaret und Goulon (1959) „Le Coma Dépassé“

Committee of Harvard
Medical School (1968) “Brain Death”

Ingvar (1971) “Brain Death”

The Conference of Royal Medical
Colleges and Faculties UK (1979) “Brain Stem Death”

The Subcommittee of A.A. N.
for quality standards (1995) “Whole Brain Death”

Brain Death basic requirements

The diagnosis of brain death is established by the medical community according to current standards of scientific and medical practice (Haupt & Rudolf, 1999)

Diagnosis of Brain Death Syndrome based on strict verification of clinical symptoms, clarification of pathology, exclusion criteria, symptoms confirmed by experienced neurologist and additional examination, EEG, TCD or substitute for brain circulation obligatory, acceptance by national laws.

Brain Death Definition

- Irreversible loss of brain and brain stem functions.
- Death of the brain is the death of a particular human organ, a critical organ, the central integrator.
- Function of brain cannot be sustained even for a while and with extraordinary care (Wijdicks, 2001)
- Total cession of brain and brain stem is based on an irreversible substantial damage of brain and brain stem
- Clinical declaration as Brain Death Syndrome

Prerequisites for diagnosis of Brain Death Syndrome

- Clarification of the pathological process
- Exclusion of confounding factors
- History and clinical course (initial stage/ full stage)
- Clear defined symptoms
- Exact and careful neurological examination
- Additional examinations
EEG obligatory, TCD or substitution obligatory
- Documentation and monitoring of clinical course
- Fixed timing for observation period
- Independent medical team

Brain Death Syndrome Symptoms

- Coma, irreversible loss of consciousness
- No response to sensory-sensitive stimuli
- No spontaneous motor actions, including primitive motor reflexes, (areflexia, atonia)
- Brainstem reflexes absent
Pupils maximal wide, without any reaction, Oculocephalic, vestibuloocular reflexes absent
Tracheal reflex absent
- Apnea, demonstrable
- Vegetative dysregulation, poikilotherm
- Autonomous spinal reflexes possible (60%)

Brain Death Syndrome Etiology clarification absolutely necessary

- Traumatic brain injury
- Encephalitis, different aetiology
- Hypoxia
- Hypoxaemia
- Brain tumour
- Subarachnoidal hemorrhage
- Hematoma: cerebral, extracerebral
- Brain or brain stem infarction
- Intoxication (exogenous, endogenous)
- Poisoning (venoms, plant toxins)
- Relaxation treatment (Baclofen, Diacepam)
- Anesthesia accident
- Hypothermia, exogenous

Confounding factors Brain Death Syndrome Mimic Brain Death

- Hypothermia below 28°
- Drug intoxication (Diazepam, Barbiturates, Baclofen)
- Metabolic disturbances (hyperglycaemia, hypoglycaemia etc.)
- Exogenic intoxication (plant toxins, venoms)
- Guillain-Barre-Syndrom including cranial nerves
- Myasthenia gravis
- Cervical spinal cord lesion

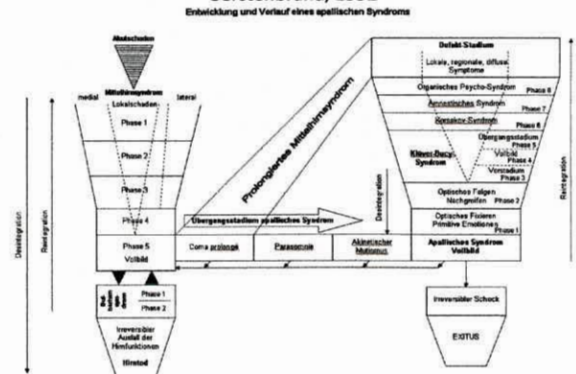
Brain Death – Team European Proposal

- Neurologist - clinical monitoring
- EEG- Specialist
- TCD- Specialist
- Anesthesiologist – ICU Physician in charge
- Excluding members of the transplantation team

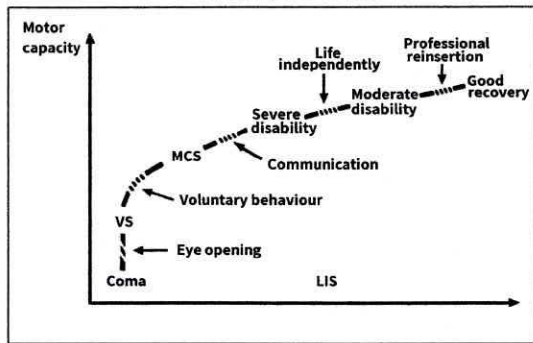
Clinical course of Brain Death Syndrome

- Initial stage (Brain stem symptoms)
Acute Midbrain Syndrome,
Midbrain – upperpons stage (Plum, Posner)
Acute Bulbar Brain Syndrome
Lower pons - upper medulla stage (Plum, Posner)
- Full stage of Brain Death Syndrome (irreversible breakdown of brain and brainstem functions)
- EEG Isoelectric line
- TCD zero flow- total absence of cerebral blood flow
- Autonomic cardiac functions
- Autonomic spinal reflexes possible (60%)

Severe Brain Damage, Initial stage to Brain Death Gerstenbrand, 1992



Severe acute Brain Damage Laureys et al, 2004



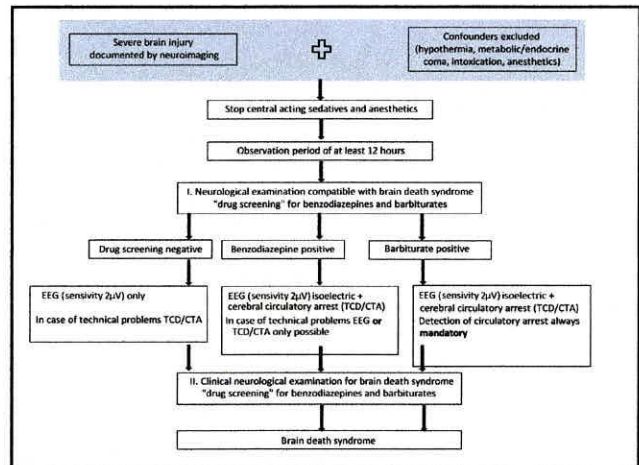
Identification of Brain Death L.P.Ivan, 1981

Differentiation of 4 clinical phases:

1. Onset of coma and apnea (Bulbar Brain Syndrome)
2. Cessation of brain and brain stem functions (irreversible Bulbar Brain Syndrome)
3. Irreversible cessation of brain functions (Apparent Brain Death Syndrome)
4. Cessation of brain functions can be proved irreversible (Brain Death)

Observation period

- Diagnosis of Brain Death Syndrome:
No observation period
- ICU-Treatment, sedoanalgesia, Brain Death Diagnosis, immediate cessation of medicaments:
Observation period: 12 hrs
- Extended Observation Period:
 - Children : 24 hrs
 - Hypothermia, exogenous below 38°: 12 hrs
 - Acute intoxications, exogenous, endogenous: 12 hrs
 - Anesthesia accidents: 12 hrs
 - Surgical incidence: 12 hrs
 - No certain etiology: 12 hrs



Minimal standard for Brain Death developing countries

Baumgartner, Gerstenbrand, 1996

- No neurologist available
- ICU, emergency rooms and intermediate care units organized.
- Neurosurgical departments fully equipped.
- Internalist ICU's without neurologist
- Neurological patients are treated by general practitioner
- EEG, TCD equipment missing or not well maintained

Minimal standard of Brain Death prerequisites

Baumgartner, Gerstenbrand, 1996

1. History and clinical course of patients, carefully analyzed
2. Clarification of basic pathology, fully cleared
3. Confounding factors excluded
4. History and clinical course detailed analyzed (Initial phase, full stage) documented
5. Symptoms of Brain Death Syndrome, full stage
6. Use of existing diagnostic abilities and equipment
7. Observation period 12 hours as a minimum

Omissions in international Brain Death Diagnosis

(Powner, 2009)

- Apnea test missing or superficially executed
- History and neurological course missing or not carefully performed
- Neurological examination reduced or casually
- Exact analysis of clinical course missed
- Endogenic intoxication missed or not cleared
- Intoxication by drug and drug metabolism missed or not cleared
- Unknown cause of „coma“

Determination of Brain Death Proposal for International Standard

- Clarification of the basic pathological process, exclusion of confounding factors, mimic Brain Death
- Exact analysis of history and clinical course
- Exact neurological examination (carefully performed)
- Additional examination , EEG, TCD obligatory, carefully and competent
- Documentation of neurological findings and additional technical results, exact protocol
- Experienced Brain Death team, 4 members with different obligations (clinic, ICU care, EEG,TCD)
- Protocol with signature of all 4 members of Brain Death team

Wednesday, September 25, 2013

16:30-18:00

Hall M

Teaching Course 51: Neuroethics (cont.)

Chairpersons: J. Bernat, *USA*
F. Gerstenbrand, *Austria*

~~16:30~~ **INTERNATIONAL CONSENSUS ON BRAIN DEATH DETERMINATION**
F. Gerstenbrand, *Austria*

17:15 **INFORMED CONSENT AND REFUSAL IN NEUROLOGY**
J. Bernat, *USA*

16:30-18:00

Hall N

Teaching Course 47: Sleep disorders / NeuroSleep (cont.)

Chairpersons: B. Högl, *Austria*
M. Grigg-Damberger, *USA*

16:30 **ROLE AND VALUE OF VIDEO-POLYSOMNOGRAPHY AND QUESTIONNAIRES IN DIAGNOSING REM SLEEP BEHAVIOR DISORDER**
B. Högl, *Austria*

17:15 **MANAGING RESTLESS LEGS SYNDROME AND ITS AUGMENTATION**
C. Trenkwalder, *Germany*

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