Brain stem death

Brain stem death is when a person no longer has any brain stem functions, and has permanently lost the potential for consciousness and the capacity to breathe.

When this happens, a ventilator keeps the person's heart beating and oxygen circulating through their bloodstream.

A person is confirmed as being dead when their brain stem function is permanently lost.

Confirming death

Confirming death used to be straightforward. Death was said to occur when the heart stopped beating and a person was unresponsive and no longer breathing. The lack of oxygen as a result of no blood flow, quickly led to the permanent loss of brain stem function.

Confirming death is now more complex, because it's possible to keep the heart beating after the brain stem has permanently stopped functioning. This can be done by keeping a person on a ventilator, which allows the body and heart to be artificially oxygenated. However, that person won't ever regain consciousness or start breathing again.

Once the brain stem has permanently stopped functioning, there's no way of reversing it and the heart will eventually stop beating, even if a ventilator continues to be used.

To save a person's family and friends from unnecessary suffering, once there's clear evidence that brain death has occurred, the person will be disconnected from the ventilator.

The brain stem

The brain stem is the lower part of the brain that's connected to the spinal cord (part of the central nervous system in the spinal column).

The brain stem is responsible for regulating most of the body's automatic functions that are essential for life. These include:

breathing

heartbeat

blood pressure

swallowing

The brain stem also relays information to and from the brain to the rest of the body, so it plays an important role in the brain's core functions, such as consciousness, awareness and movement.

After brain death, it's not possible for someone to remain conscious.

How brain death occurs

Brain death can occur when the blood and/or oxygen supply to the brain is stopped. This can be caused by:

cardiac arrest – when the heart stops beating and the brain is starved of oxygen

heart attack (/illnesses-and-conditions/heart-and-blood-vessels/conditions/heart-attack/) – a serious medical emergency that occurs when the blood supply to the heart is suddenly blocked

stroke (/illnesses-and-conditions/brain-nerves-and-spinal-cord/stroke/) – a serious medical emergency that happens when the blood supply to the brain is blocked or interrupted

blood clot – a blockage in a blood vessel that disturbs or blocks the flow of blood around your body

Brain death can also occur as a result of:

a severe head injury (/illnesses-and-conditions/injuries/head-and-neck-injuries/severe-head-injury/)

a brain haemorrhage

infections, such as encephalitis

a brain tumour (/illnesses-and-conditions/cancer/cancer-types-in-adults/brain-tumours/)

Confirming brain death

Although rare, a few things can make it appear as though someone is brain dead.

These include drug overdoses (particularly from barbiturates) and severe hypothermia (where body temperature drops below 28C).

Therefore, a number of tests are carried out to check that brain death has actually occurred, like shining a torch into both eyes to see if they react to the light.

Diagnosing brain stem death

There are a number of criteria for diagnosing brain stem death.

For a diagnosis of brain stem death to be made:

a person must be unconscious and fail to respond to outside stimulation

a person's heartbeat and breathing can only be maintained using a ventilator

there must be clear evidence that serious brain damage has occurred and it can't be cured

Ruling out other conditions

Before testing for brain stem death, doctors must carry out a series of checks to ensure that the symptoms aren't being caused by other factors, like:

an overdose of illegal drugs, tranquillisers, poisons or other chemical agents

an abnormally low body temperature (hypothermia)

severe under-activity of the thyroid gland

Once these factors have been ruled out, tests are carried out to confirm brain death. The diagnosis of brain death has to be made by two senior doctors. Neither of them can be involved with the hospital's transplant team.

The doctors will explain the tests to you and they'll keep you informed about your loved one's condition at all times.

Tests

The doctors will run a series of tests. Both doctors have to agree on the results for a diagnosis of brain death to be confirmed. The tests are carried out twice to minimise any chance of error.

The tests used to determine whether brain stem death has occurred are outlined below:

A torch is shone into both eyes to see if they react to the light.

The cornea (transparent outer layer of the eye), which is usually very sensitive, is stroked with a tissue or piece of cotton wool to see if the eye reacts.

Pressure is applied to the forehead and the nose is pinched to see if there's any movement in response.

Ice-cold water is inserted into each ear, which would usually cause the eyes to move.

A thin, plastic tube is placed down the trachea (windpipe) to see if it provokes gagging or coughing.

The person is disconnected from the ventilator for a short period of time to see if they make any attempt to breathe on their own.

Brain death will be diagnosed if a person fails to respond to all of these tests.

Occasionally, a person's limbs or torso (the upper part of the body) may move, even after brain stem death has been diagnosed.

These spinal reflex movements are generated by the spinal cord and don't involve the brain at all. Therefore, they won't affect the diagnosis of brain death.

Source: **NHS 24**

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