Medicine for Managers

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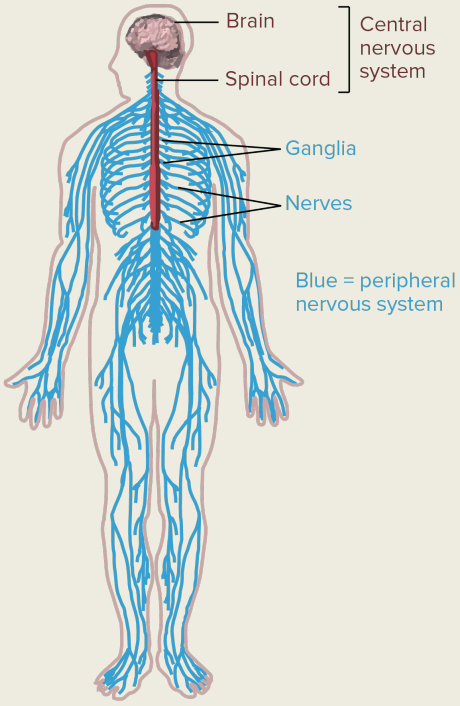
Cerebral Hypoxia – what is it?

Cerebral hypoxia occurs in any circumstances where the brain does not receive enough oxygen. Anoxia is the term used in those situations when no oxygen reaches the brain. Any reduction in the oxygen supply to the brain is a medical emergency and the nerve cells in the most sensitive parts of the brain deprived of oxygen will start to die off in as little as three minutes. Destroyed brain cells cannot regenerate and such damage is irreversible.

The brain is the indescribably complex system which operates and controls the whole of the nervous system.

In fact the brain uses about a fifth of the body's total oxygen supply.



There are a large number of reasons why the brain may become deprived of oxygen and these include:

- Heart attack or stroke
- Head injuries
- Electrocution
- Strangulation or suffocation
- Choking
- Drowning
- Smoke inhalation and carbon monoxide poisoning
- Drug overdose

The presentation of the hypoxia will depend on the severity and nature of the cause and whether the oxygen supply is reduced or cut off. In situations such as choking or carbon monoxide poisoning, the effects may be progressive. If the heart stops or the airway is completely cut off, the effects are dramatic.

The symptoms may be:

- Disorientation
- Rapid shallow breathing
- The lips and nail beds may develop a bluish colour

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- Pupils may dilate and seizures may occur
- Complete unresponsiveness and coma

After about three or four minutes of severe oxygen deprivation, brain death starts to occur and if the oxygen supply is not restored, it is progressive resulting in complete brain death after between ten and fifteen minutes.

No brain activity remains.

In circumstances of partial or complete brain death, a body can be maintained using mechanical and biochemical life support.

The presence and degree of oxygen deprivation can be assessed by a plethora of medical examinations, designed to elucidate or confirm the cause and to evaluate the degree of destruction of brain function.

Apart from radiography and the comprehensive range of blood tests, specific investigations will include:

- CT and MRI scans to look for evidence of and the degree of brain damage
- Angiography studies, which involve the introduction of radio-opaque dyes into the blood and reviewing the degree and nature of the blood flow through parts of the brain
- Electroencephalography (Ee-leck-tro-en-seff-el-og-raff-ee) which involves the placement of electrodes on the head to measure electrical activity in the brain
- Measurement of evoked potentials which is used to assess the response of the brain to stimulations such as touch, temperature or pain.

The Management of Hypoxia.

The recognition of any degree of hypoxia is a medical emergency and the immediate management will depend on the cause.

- Cardiac arrest
- Respiratory obstruction as a result of, for example, a ligature round the neck or the classic 'swallowed gobstopper' obstructing the airway.

The management is to restore oxygen supply to the brain as quickly as possible.

- Any airway compromise should be eliminated if at all possible to restore patency
- If the patient's airway is not obstructed but he or she has stopped breathing and/or there is no pulse, cardio-pulmonary resuscitation should be started immediately. An emergency ambulance must take the patient to an accident and emergency department as quickly as possible whilst the resuscitation measures continue unabated.

Once in an appropriately equipped medical intensive care unit, the patient can be resuscitated with appropriate levels of care.

Normally the nursing is intensive, with a nurse for each patient all the time.

The equipment to which the patient is attached effectively takes over all the bodily functions to ensure that the activities consistent with life can continue.

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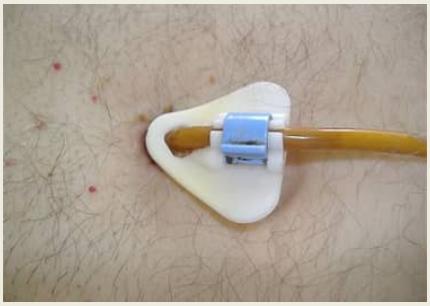
The equipment connected will include:

- A ventilator, which controls the exchange of gases through the lungs. The air is provided to the patient through a tube inserted into the trachea through the mouth or, sometimes, directly, through an incision in the neck below the larynx (Adam's apple).
- There is equipment which will monitor all vascular and cardiac function to maintain heart rate and blood pressure.
- The level of blood oxygenation will be regularly monitored.
- The body requires ongoing nutritional supply and also it is essential to control the blood electrolytes, such as sodium and potassium. Blood lines inserted intravenously will therefore supply and maintain appropriate fluid balance, provide any elements to maintain the body chemistry and for the administration of any drugs.
- Nutritional requirements may be met by administration through the intravenous line (called ***parenteral nutrition***) where all required nutrients, including carbohydrates, proteins, fats, vitamins, minerals and electrolytes are supplied into the blood.
  In patients where the gut is working normally, the preferred feeding approach may be through ***enteral nutrition*** where the food and nutrients are delivered directly into the gut via a small incision in the abdomen and a tube inserted into the stomach. This is called a PEG (***Percutaneous Endoscopic Gastrostomy***) tube. If, for some reason, the tube cannot be placed in the stomach, it may be passed into the jejunum – the first part of the small intestine - (a ***PEJ***)



- Drains and Catheters are inserted to drain any accumulated fluids from the body. Such a tube, a ***urinary catheter***, may be passed into the bladder to drain urine.

Once the artificial life support is established, the individual can be supported and maintained indefinitely although, of course, the outlook for any patient receiving such resuscitation will depend on factors including:

- The length of time the brain is deprived of oxygen
- The severity of the brain damage and the areas damaged
- The age of the patient (younger patients have more ability to recover than older patients).

Over time, the patient will be monitored and decisions will be made about the ongoing care. The possible outcomes will be:

- That the patient is successfully weaned off the life support

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- That the patient is maintained on some sort of long-term ventilator support
- That an agreement is reached to withdraw the ventilator with the understanding that death will ensue.
- There will often also be the discussions about organ donation

The latter decision may invoke a range of social, legal, ethical and emotional issues.

The whole country became involved through the media about the emotional turmoil and the legal and medical conflicts and decisions involving the tragic death of Archie Battersbee, which involved a four-month court battle.

More next week.

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