Today's Treatment

Use of anaesthesia

Care of the unconscious

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Normal conscious behaviour means awareness of self and the environment and depends on intact brain function.¹ Changes in the level of consciousness reflect an abnormal function of the brain. The degree, depth, and duration of altered consciousness may vary from drowsiness to brain death, and "coma" or unconsciousness is best defined as an inability to obey commands, utter recognisable words, or open the eyes.²

Pathological conditions associated with this state are brain injury from trauma; cerebrovascular accidents; hypoxia; hypotension (low perfusion states); uncontrolled epilepsy; and disorders of metabolism, such as hepatic and renal failure and drug overdose.

As well as managing the primary cause of the coma, energetic treatment is needed to prevent the complications of unconsciousness, the most serious of which are hypoxia and hypotension.

All unconscious patients run the risk of an obstructed airway from the tongue falling back into the oropharynx. The inability to cough or swallow leads to an accumulation of secretions in the mouth, pharynx, trachea, and bronchi. Vomit and regurgitated gastric contents may be inhaled giving rise to the acid-aspiration (Mendelson's) syndrome in the lungs. The already damaged brain cannot withstand any further insults that may occur from inadequate cerebral oxygenation and perfusion due to a low arterial PO_2 or low blood pressure.³

The unconscious patient may need total care for days, weeks, or months, the problems being those of maintaining vital functions (adequate ventilation, circulation, and nutrition) and general nursing care.

Anaesthesia is a pharmacologically induced state of unconsciousness and the well-trained anaesthetists of today, with their skill in care of the airway, endotracheal intubation, intravenous cannulation, ventilator management, and knowledge of applied pharmacology and respiratory physiology, are particularly able to care for these patients. The skills and lessons learnt in the operating theatre have enabled them to take part in the development, organisation, and management of patients in immediate care schemes and intensive treatment units and to teach these skills to other doctors, nurses, paramedical staff, and ambulance men.

Immediate management

As soon as an unconscious patient is seen it is vital to establish and maintain a clear airway, adequate oxygenation, and alveolar

ventilation, and satisfactory cardiovascular function is needed to maintain the cerebral perfusion pressure.

The mouth and pharynx should be cleared of any debris, dentures, blood, and vomit and the patient turned into the semiprone position (fig), so that the tongue can fall forwards, and the lower jaw should be pulled forward by placing the hands under the angle of the mandible. This manoeuvre should be performed with great care if there is any suspicion of a neck injury. An oropharyngeal airway of the Guedel type can then be inserted, but the patient may resist and vomiting, coughing, and bleeding be provoked.

A nasopharyngeal airway is an alternative and has the advantage of being tolerated at much lighter levels of consciousness, can be inserted into a patient whose jaw is tightly clenched, and provides a ready passage for a suction catheter.⁴ With this type

Two semiprone positions for unconscious patients.

of airway protection, which is not foolproof, the patient must be kept under very close observation. If these measures are not adequate because of an inefficient cough reflex or obvious respiratory failure a cuffed endotracheal tube should be passed. The aid of a short-acting neuromuscular blocker, such as suxamethonium, may be needed if there is much masseteric or laryngeal spasm, and cricoid pressure may help to prevent the regurgitation of stomach contents.

Endotracheal intubation is not always easy in the unconscious patient and should be performed only by competent, trained people. Persistent attempts at intubation can provoke bleeding and exacerbate hypoxia, and unrecognised oesophageal intubation can be disastrous. An alternative to endotracheal intubation is the cuffed oesophageal obturator airway, which does not require the use of a laryngoscope for its passage and prevents the regurgitation of vomit and inflation of the stomach with air.⁵ There may be occasions during the initial management of an unconscious patient when relief of complete airway obstruction is impossible, and urgent tracheotomy or cricothyrotomy may be necessary. As a first-aid measure a wide bore (2-3 mm) needle can be passed through the cricothyroid mem-

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brane and enough oxygen can be given to sustain life. When a clear airway has been established 100% oxygen should be administered until the appropriate oxygen requirements can be determined from the results of arterial blood gas analysis.

All unconscious patients should have a gastric tube passed through the nose unless there is a head injury with fractures of the base of the skull or frontal sinuses, when the oral route is preferred. The gastric tube provides a route for oral feeding and aspiration of unabsorbed stomach contents. Should there be problems with the passage of the tube, an anaesthetist can often help by passing it through a long endotracheal tube that has been gently inserted into the oesophagus.

Before a definitive assessment of the unconscious patient is made or he is moved from the scene of an accident or incident, or from one department to another within a hospital or transferred to another hospital, the airway must be protected, hypotension corrected, and the patient accompanied by a trained escort, who is equipped with appropriate resuscitation and suction apparatus.

Assessment and routine observations

The condition of the unconscious patient may be changing all the time and so continuous observation is essential, since signs of deterioration will call for urgent action. The following observations should be made when the patient is first seen and then at least half-hourly and recorded on an appropriate chart, which is designed to be easily understood by medical and nursing staff and should show trends from which subsequent changes can be evaluated.

CONSCIOUS LEVEL

An alteration in the conscious level will precede all other changes in the vital and neurological signs.⁶ The level of consciousness should be established as soon as possible, and an accurate description of behaviour is needed. A useful method of assessment is the Glasgow coma scale,⁷ which is clear and informative and avoids the use of confusing terms such as semi-conscious, stupor, or semicomatose. It depends on the observation and recording of the response to three separate aspects of behaviour, which are eye opening, verbal responses, and the motor response to a verbal command or painful stimulus. The observer must be aware that the conscious level can remain influenced by hypoxia, sedatives, general anaesthesia, alcohol,⁸ and metabolic problems.

VITAL SIGNS

The pulse rate and rhythm, systolic and diastolic blood pressure, pulse pressure, respiratory rate and pattern, and temperature must all be recorded.

A slow pulse, a rise in blood pressure, and slowing of respiration leading to periodic respiration and apnoea are signs of cerebral compression. A rising pulse and falling blood pressure are associated with haemorrhage and septic shock, and a rising pulse and blood pressure and rapid shallow respirations with hypoxia.

FOCAL NEUROLOGICAL SIGNS

Pupils—The pupils should be examined with a good light. The incidence of pupillary abnormalities in comatose patients is high, and careful attention should be given to the size, shape, and reaction to light.

Movement of the limbs—If localised brain damage is suspected additional assessment of the movement of each limb is needed in response to a verbal command or painful stimulus.

Long-term care

AIRWAY AND VENTILATION

A clear airway and adequate alveolar ventilation, having been established must be maintained. Auscultation of the chest, a chest radiograph, and determination of arterial blood gases should be performed daily. The P_{aO_2} should be kept between 9.5 kPa (70 mm Hg) and 20 kPa (150 mm Hg) with an accurate prescription of supplemental oxygen if necessary, using high air flow oxygen entrainment devices. The P_{aCO_2} should lie between 3.3 kPa (25 mm Hg) and 6 kPa (45 mm Hg). Controlled mechanical ventilation of the lungs may be necessary in cases of respiratory failure or severe head injuries.

Prolonged airway care will be necessary in those patients where lengthy coma is anticipated and until they can care for their own airway. In the choice of method the advantages of intubation or tracheostomy must be weighed against the risks and the facilities available. The safe period of endotracheal intubation is not defined, but it would appear to be about seven days.⁹ The cuffs on the endotracheal and tracheostomy tubes should be of the low-pressure type and the inspired air and oxygen humidified.

Regular tracheobronchial suction will be needed to remove secretions, and the patient should be turned from side to side every two hours to encourage drainage from all lobes of the lungs. The physiotherapist may be of immense service and should visit the patients at least twice a day, trying to coincide with turning periods. They should also carry out vibration and rib springing of the chest wall except when there are fractured ribs, when gentle percussion will suffice. If controlled ventilation is in use some physiotherapists find that a period of manual hyperventilation helps to express secretions into the tracheo-bronchial tree. Bronchoscopy should rarely be necessary and is best performed with a fiberoptic instrument.

CARDIOVASCULAR FUNCTION

The importance of maintaining an adequate cerebral perfusion pressure has already been emphasised, and the systolic blood pressure should not be allowed to fall below 80-90 mm Hg. Also, it is now known that arterial hypertension in the presence of brain damage may lead to increased formation of cerebral oedema, so systolic blood pressures above 160 mm Hg should be avoided. The hypertension may be due to hypoxia, pain, a full bladder, restlessness, or an expanding brain lesion that must be excluded before prescribing sedation, analgesics, and antihypertensive treatment to maintain reasonable control of the blood pressure. A small dose of intravenous chlorpromazine 2.5-5 mg will often both sedate and lower blood pressure, but occasionally more powerful hypotensive drugs are needed, such as hydralazine 5-10 mg and labetalol 10-20 mg.

FLUID AND ELECTROLYTE BALANCE

Severe brain damage may produce complicated metabolic and hormonal upsets, and a careful watch must be kept on the concentrations of plasma sodium, potassium, bicarbonate, urea, and creatinine, and osmolality by daily estimation, which together with fluid balance intake and output charts will avoid the dangers of under- or over-hydration. An intravenous fluid regimen may be necessary, but in patients with cerebral oedema it is wise to restrict fluid maintenance to not more than 65-75% of normal.

NUTRITION AND FEEDING

As previously mentioned, all unconscious patients should have a gastric tube passed through the nose unless there is a risk

of cerebrospinal fluid rhinorrhoea. The tube should be aspirated every two hours and be retained until the swallowing reflex returns. Oral fluids are not needed for the first 12 hours and then, provided that bowel sounds are present, an oral feeding regimen may be used. The quantity of feed may have to be adjusted according to the patient's total fluid requirements and balanced against any intravenous fluids being given. The use of fine bore nasogastric tubes and continuous oral feeding is not recommended because of the danger of regurgitation of feeds and aspiration pneumonia. If oral feeds are not tolerated intravenous feeding may be necessary, and an anaesthetist may be asked to insert a central venous catheter for this purpose.

A serious complication of brain injury and coma which may upset nutrition and electrolyte and fluid balance is gastrointestinal bleeding. This may be due to "stress," steroids, or the presence of the nasogastric tube. If the patient is receiving steroids oral aluminium hydroxide and an H_2 -receptor blocking agent may prevent this complication.¹⁰

SEDATION AND ANALGESICS

Unconscious patients pass through a period of restless, disorganised behaviour before they regain a normal conscious level. This may be useful as the lungs and limbs are exercised, but the restlessness can be due to hypoxia, a full bladder, or pain. Provided that cerebral compression has been excluded sedation can be given, promazine 25-50 mg or chlorpromazine 25-50 mg being the most useful. For pain potent narcotic analgesics that cause respiratory depression should be avoided, and dihydrocodeine tartrate 30-60 mg or codeine phosphate 30-60 mg may be given. Local anaesthetic nerve blocks can also be used to reduce pain from, for example, fractured ribs or a fractured femur.

GENERAL NURSING CARE

Eyes—Some unconscious patients lie with their eyes open and have an inefficient corneal reflex, which leaves the cornea exposed and may lead to keratitis and corneal ulcers. The eyes should be swabbed every two hours with physiological saline to remove discharge and debris. Artificial tears (0.3% hypromellose drops) should be instilled every two hours and the eyes kept shut with small pieces of strapping or a stitch through the upper lid, the threads being secured to the cheek by strapping. Should infection occur chloromycetin ointment is recommended.

Mouth care—Dentures should have been removed. There is a risk of parotitis if the mouth is not kept clean, and it should be swabbed every two hours with sodium bicarbonate followed by glycerin and thymol mouth wash. If the mouth is very dirty and crusted cleaning with hydrogen peroxide is useful. Yellow paraffin applied to the lips prevents angular stomatitis.

Bladder—Incontinence and wet beds predispose to bed sores. Men who are seriously ill will need catheterising for 5-7 days. A catheter may then usually be replaced by Paul's tubing taped around the penis and the urine collected in a bottle. Women will need to be catheterised, but for a short term may lie on incontinence pads.

Bowels—Immobility and lack of dietary fibre result in constipation. Sennoside or danthron can be given down the gastric tube daily to stimulate the bowel and soften the stools. Enemas or manual evacuation every third day may be necessary. There is a risk of diarrhoea from infection, antibiotics, hyperosmolar feeds, bolus feeding, and attempting to institute a full feeding regimen too quickly. The diarrhoea can be checked with kaolin and by stopping the feeds.

Skin and pressure areas—To avoid pressure necrosis of the skin the patients should be kept clean and dry. They should be turned every two hours and washed once a day. Sheepskins are useful for the patient to lie on and as heel pads.

Limbs—The limbs should be taken through a range of active assisted movement daily by the physiotherapist to prevent contractures.

Temperature control—Hyperpyrexia may be due to several factors—infections of the respiratory tract, urinary tract, or wounds; drug reactions; or damage to the hypothalamic temperature-regulating centre. The temperature should be kept below 38°C and the fever treated by cooling the patient with a fan and a wet sheet. Chlorpromazine 25-50 mg every six hours and aspirin suppositories may be necessary as well as appropriate antibiotics.

Epilepsy—Convulsions may occur as a result of brain damage. It is important, however, to be cautious about giving immediate large doses of anticonvulsants that will depress the conscious level and make serial observations difficult. The development of severe epilepsy is serious. The consensus of opinion is that an intravenous injection of diazepam or clonazepam is the most effective way of treating this. Also chlormethiazole can be given by intravenous infusion, as can thiopentone. Paraldehyde is useful when there are no veins, and in intractable cases it may be necessary to paralyse and ventilate the patient. In all cases it is important to give maintenance doses of phenytoin to produce therapeutic blood concentrations.

Conclusion

A successful outcome for patients with recoverable causes of coma requires a consistently high standard of care and close co-operation among anaesthetists, clinicians, nursing staff, physiotherapists, and ambulance personnel.

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What is the latest information on the possible cause of Dupuytren's contracture?

The most convincing evidence suggests that the predisposition to Dupuytren's contracture is inherited as a dominant gene,¹ although the disorder is not usually manifest until late in life. It is then remarkably common, and may be found in around one-quarter of men over 60. The often-quoted associations with epilepsy, alcoholic cirrhosis, and perhaps diabetes are not consistently supported by the evidence. Nor is there any good reason to implicate trauma, occupational or otherwise.

¹ Ling RSM. The genetic factor in Dupuytren's disease. *J Bone Joint Surg* 1963; 45B:709-18.