seizure. In the post-ictal phase, the marked depression of EEG activity is also typical of a generalized tonic-clonic seizure.

Our study showed that BIS values decrease in the ictal phase. It is difficult to explain this because the algorithm used to calculate BIS has not been designed with EEG collected during seizures, but one should notice that there is a progressive decrease in EEG wave frequencies around 3 Hz and an increase in amplitude during the clonic phase,1–3 which could be misinterpreted as δ waves observed at deepening of hypnotism. Our results are in accordance with a reduction of the BIS value during perioperative seizure.4 5 The reduction of BIS could also be explained by the hypnotic drug, but we took caution to avoid that by allowing the BIS to stabilize before the ECT began. Also, BIS values decreased continuously without any variation of SR, which suggests that the downward trend is not caused by a hypnotic effect. In the post-ictal phase, related to cortical electric suppression and a consequence of the generalized seizure, there is a frank increase in SR values. As the BIS algorithm takes into account the flat or nearly flat EEG, the BIS decreased significantly during the post-ictal period, as expected.

In clinical practice, we suggest that BIS, SR values, and EEG should be analysed jointly when monitoring sedation. Seizure must be suspected whenever BIS and SR values change markedly or the EEG shows variations in amplitude, rhythm, or both. At the same time, other diagnoses should be sought, such as acute cerebral hypoperfusion and hypoxia, hypoglycaemia, hypothermia, and increased sedation.6 In all instances, when a seizure is suspected, the standard EEG with multiple leads should be used whenever available to confirm the diagnosis, because it remains the gold standard in diagnosis of seizure.

Hydrogen peroxide: more harm than good?
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Editor—Hydrogen peroxide remains a frequently used agent in operating theatres despite its marginal benefits and potential for serious complications. We are writing to remind anaesthetists of the risks of hydrogen peroxide use and pose the question: does hydrogen peroxide cause more harm than good?

Hydrogen peroxide has long been used as a disinfectant and is effective against viruses, bacteria, yeasts, and bacterial spores in vitro. However, hydrogen peroxide is inactivated in vivo by catalase, which catalyses the breakdown of hydrogen peroxide to oxygen and water. Two early human studies found hydrogen peroxide to be ineffective at reducing bacterial counts and rates of wound infection.1–3 More recently, it has been shown to be inferior to both povidone iodine and Ringer’s lactate solution in reducing the rates of wound infection.3

In orthopaedic surgery, hydrogen peroxide has been used for decades to prepare trabecular bone during cemented hip arthroplasty in order to maximize bone–cement strength, although strong evidence is lacking. An early study reported superior cement fixation in an arthroplasty model using cadaveric bone,4 but two more recent studies found that hydrogen peroxide neither increased nor decreased bone–cement strength.4 5 In addition, hydrogen peroxide may contribute to the development of aseptic loosening of joint implants6 and is known to be toxic to osteoblasts.

The most serious consequence of hydrogen peroxide use is rapid oxygen release resulting in systemic gas embolus. The breakdown of 20 ml of 3% hydrogen peroxide solution releases 200 ml of gaseous oxygen; a larger volume or a higher concentration of hydrogen peroxide will lead to the release of a greater volume of oxygen. In adults, as little as 20 ml of 1.5% hydrogen peroxide has been associated with haemodynamic instability,8 and even smaller volumes can cause cardiac arrest in children.9 A recent report of cardiac arrest after hydrogen peroxide use10 triggered the publication of a safety alert from the United Kingdom Medicines and Healthcare Regulatory Agency.11 In addition to haemodynamic instability, paradoxical oxygen embolism may result from the use of hydrogen peroxide in the presence of a patent foramen ovale,12 the prevalence of which is purported to be between 25 and 30% in the general population.

Although the use of hydrogen peroxide in closed cavities is thought to pose a higher risk of oxygen embolus, instances of oxygen embolus have been reported in many other circumstances, including in vascular,13 orthopaedic,14 and spinal surgery.15 In neurosurgery, in addition to systemic oxygen embolus, the

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Declaration of interest
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use of hydrogen peroxide has resulted in direct neural toxicity, cerebral infarction, and tension pneumocephalus.\(^1\)\(^4\)

Given the well-reported hazards of hydrogen peroxide use and the lack of robust evidence purporting any therapeutic benefit, is it finally time to consign this agent to history?

**Declaration of interest**

None declared.

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**Ventilation through an extraglottic tracheal tube: a technique for deep extubation and airway control**

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Editor—Tracheal extubation after general anesthesia is a critical event of an anesthetic, probably more important than induction and intubation of the airway; minor complications can result in significant morbidity and even mortality.\(^1\)\(^2\) Both the Fourth National Audit Project and the ASA closed claims analysis reported complications from extubation.\(^3\)\(^4\) The Difficult Airway Society developed a systematic approach to anticipated easy extubations and to those deemed difficult. Asleep extubation (commonly referred to as deep extubation), as opposed to awake extubation, is in a different arm of the Difficult Airway Society algorithm from the easy airway extubation.\(^5\)

With such concerns in mind, we developed a technique that ideally incorporates the following features: well tolerated by the patient (no cough reflex, minimal gag reflex); avoids unnecessary manipulation to maintain a patent airway; preserves oxygenation; facilitates ventilation; and avoids the use of face-mask ventilation (which may not be possible or desirable for certain procedures). The technique involves withdrawal of the tracheal tube from the larynx and moving it in a manner such that the tip sits in the peri-epiglottic or supralaryngeal space (extraglottic), with the cuff retroligament to maintain a patent airway during deep extubation, to provide adequate oxygenation and ventilation and to spare costs related to additional airway devices, such as a supraglottic airway device. The technique is referred to as ‘asleep staged extubation technique’, and is appropriate in patients with low risk for aspiration.

We have grown accustomed to exchanging tracheal tubes for laryngeal mask airways. It logically follows that the tracheal tube (airway conduit) could itself be left in place in a supraglottic position in order to facilitate ventilation. This technique can be used for both oral and nasal tracheal tube extubation, when inspiration and regurgitation risk is minimal. Positioning the tip of the tube close to the glottis requires some experience, mostly based on anatomical markers and clinical monitoring of