Bispectral index sensor as a possible cause of postoperative visual loss after frontal craniotomy

Editor.—Postoperative visual loss (PVL) after non-ocular surgery is rare, but a devastating complication.° We report a patient with unexpected PVL after brain tumor removal by frontal craniotomy. The development of PVL was attributed to the bispectral index (BIS) sensor (BIS standard, Aspect Medical Systems) fixed on the forehead. A 38-year-old female patient was undergoing right frontal brain tumor removal. She had complained of headache and nausea suggesting increased intracranial pressure, but otherwise she was quite healthy. After placing a BIS sensor on the left forehead, general anesthesia was induced with a target control infusion of propofol and continuous infusion of remifentanil 0.5 \( \mu \text{g} \text{ kg}^{-1} \text{ min}^{-1} \). Her trachea was intubated after vecuronium 6 mg. Anaesthesia was maintained with target control infusion of propofol and continuous infusion of remifentanil 0.15–0.25 \( \mu \text{g} \text{ kg}^{-1} \text{ min}^{-1} \). Skin incision was performed bilaterally along the hairline on the forehead, and the myocutaneous flap was retracted anteriorly and inferiorly near the orbit. Right frontal craniotomy was performed, during which the connector between the BIS sensor and cable was turned down to the left side and also fixed on the left forehead. The surgical procedure was uneventful, but lasted \( > 8 \) h. Systolic arterial pressure was controlled between 120 and 140 mm Hg. BIS value stayed between 40 and 50. Total amount of fluid infused was 5200 ml, blood loss was 290 ml, and urine output was 2680 ml. She emerged from anaesthesia uneventfully after surgery. Her first complaint of left visual loss and several small blisters above her left eyelid were noted after admission to the intensive care unit. An ophthalmologist’s examination revealed the following: her left eye was completely blind, the left direct light reflex disappeared although the consensual light reflex was normal, the left ocular muscle function was slightly impaired, and the fundal appearances presented normal optic disk and retina. Dexamethasone was administered immediately. The fundal appearances continued to be normal without the appearance of cherry red spot. Imaging studies revealed neither cerebral infarction nor surgery-related injury to the orbit or optic nerve. Electroretinogram showed slight b-wave reduction suggesting left retinal damage, whereas fluorescein angiography demonstrated normal retinal circulation. The absence of visual evoked potential suggested injury between the optic nerve and the optic tract. The left direct light reflex began to appear after 1 month, but her vision is still only to hand movement. Left optic disk became pallid after 2 months, suggesting the development of optic nerve atrophy.

Bilateral orbital infarction attributed to orbital compression by retraction of a myocutaneous flap over the eyes during frontal craniotomy has been reported, and occlusion of the ophthalmic artery and its branches led to ischaemia of the whole orbit because of increased intraorbital pressure. In our case, the bulky BIS sensor and connector fixed on the left forehead may have caused orbital compression when the myocutaneous flap was retracted near the orbit, increasing left intraorbital pressure. Several small blisters above the left eyelid suggested firm retraction. Increased intraorbital pressure caused vascular insufficiency to the optic nerve, leading to the development of PVL. Left retinal damage and ocular muscle dysfunction also developed as the result of ischaemia caused by increased intraorbital pressure. On the other hand, impaired orbital venous drainage caused by increased cerebrospinal fluid pressure associated with brain tumour might contribute to vascular insufficiency. We should be cautious when placing a BIS sensor on the forehead during frontal craniotomy.

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**Video laryngoscopy and external laryngeal manipulation**

Editor.—We read with interest the article written by Groeben and colleagues, comparing direct laryngoscopy with video laryngoscopy in expected difficult tracheal
intubations. We also have used the Storz video laryngoscope in our institution and found it a very useful tool for difficult intubations and for teaching, not only for novice anaesthetists, but also for anaesthetic assistants, as they too are able to visualize the view of the glottis during external manipulation of the larynx and when applying cricoid pressure for rapid sequence inductions. We have found that the assistant is able to optimize the view of the glottis for the anaesthetist by directly visualizing the view on the portable screen, and not rely solely on feedback from the anaesthetist, as with conventional direct laryngoscopy.

In their study, Groeben and colleagues fail to say whether the assistant performing the external manipulation was allowed to see the view obtained on the screen in the video laryngoscope group. It would be interesting to know whether a subanalysis of this group of patients would show a significant difference in the grade of the view obtained and success of tracheal intubation, as the direct feedback obtained from the video laryngoscope allows the assistant to provide a much better and coordinated view for the anaesthetist during external laryngeal manipulation. Do the authors agree and did they consider a subanalysis of this group in their study?

In the study, a subanalysis of the patients with Cormack and Lehane grade III and IV was performed and this showed a significant difference in the intubation time, in favour of the video laryngoscope group and a significantly better rate of successful intubation. They also found that fewer manipulations were required in this group. The authors, however, failed to state how many of the cases in this subanalysis group required external laryngeal manipulation, although the need for optimizing manoeuvres was mentioned. These significant differences could be attributed to a poorer view of the glottis obtained as a result of ‘blind’ external manipulation in the direct laryngoscope group compared with the video laryngoscope group, where there is improved coordination between both the assistant and the anaesthetist as a result of the image seen on the monitor, which has been shown to result in a significant advantage over the conventional laryngoscope technique. Finally, do the authors feel that they could also conclude that the use of the video laryngoscope eases external laryngeal manipulation, especially in anticipated difficult intubation?

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Editor—We thank Dr Ahmad and his colleagues for their comments and questions concerning our article. They stress the impact of an optimized view by the assistance for intubation on the success rate and time for intubation, and whether the assisting staff shared the view on the monitor of the video laryngoscope. To maximize the benefit of the technique, the assisting staff did share the view on the monitor. We agree that the change from a blinded assistant to a seeing one improves the success. However, this effect cannot be quantified from our study, and would require a different study design. For a proper analysis, all the intubation would need to be performed with the video laryngoscopy with either blind or seeing assistant staff. In our study, the difference between the conventional technique and the improved view with the video laryngoscope was in our opinion more important than the difference in the view of the assistant staff. Overall, we think the improved view for the assistant staff contributes to the positive result, but the extent of this effect cannot be analysed from our study. To clarify this question, further research is required.

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Response entropy–state entropy difference and nociception: a matter of context

Editor—Aho and colleagues concluded that ‘response entropy (RE)–state entropy (SE) difference cannot reliably be used as an indicator of nociception in patients anaesthetized with propofol, nitrous oxide and remifentanil without neuromuscular blocking drugs’. This statement should be qualified by adding ‘when the values are averaged over 15 s and measured in a state of anaesthesia inadequate for the level of noxious stimulation’.

The authors reached their conclusion based on the observation that the entropy difference after intubation was not different between patients with and without remifentanil. This was because, in both groups, while the RE increased immediately with intubation, the SE also increased, and when the difference was averaged over 15 s, the groups were similar. Later, however, after trochar insertion, a weaker stimulation than intubation, the entropy difference was greater in the non-remifentanil group, a more expected result.


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