This report emphasises the need for a broad differential diagnostic approach when confronted with neurological symptoms following dural puncture; not all headaches are just a PDPH.

References
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Use of nitrous oxide causing severe visual loss 37 days after retinal surgery

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A case of severe visual loss following nitrous oxide anaesthesia in the presence of an intraocular perfluoropropane (C3F8) gas bubble is described. The diabetic patient had previously undergone vitreoretinal surgery at which time the gas had been inserted. The case highlights the use of...
The use of nitrous oxide anaesthesia in patients with an intraocular gas bubble is potentially sight threatening. Patients who have had vitreoretinal surgery often have a gas bubble deliberately left within the eye as it helps keep the retina attached whilst adhesions develop. Filtered room air, sulfurhexafluoride (SF6) and perfluoropropane (C3F8) are the most commonly used gases. By varying the concentration, volume and type of gas used, bubbles can be produced that will last up to 70 days before being completely absorbed. If nitrous oxide is administered during this time, the bubble will rapidly expand with the risk of retinal and optic nerve ischaemia. At least seven cases of severe visual loss have been reported in patients undergoing general anaesthetics up to 30 days following retinal surgery. This new case occurred 37 days following retinal surgery.

**Case report**

A 55-yr-old man underwent a vitrectomy for a tractional retinal detachment in his left eye secondary to proliferative diabetic retinopathy. His vision at that time was 6/5 in his right eye and 6/36 in his left. The retina in the left eye was successfully reattached and 16% C3F8 gas was inserted into the eye at the end of surgery. On the first postoperative day, it was observed to fill 90% of the intraocular volume and the intraocular pressure was normal.

He was making good postoperative progress until 37 days later when he underwent elective revision of a femoral-popliteal bypass under general anaesthetic. This was performed in the same healthcare trust but in a different hospital, using separate case notes from those used in the eye hospital. His recent ocular surgery was noted in the preoperative assessment but the use of intraocular gas was not. It had, however, been recorded in his ophthalmology case notes 1 week previously that he still had a 30% intraocular gas fill. The general anaesthetic given for his vascular procedure was uneventful. He was induced with fentanyl and propofol, and intubated after administration of vecuronium. Maintenance of anaesthesia was achieved with a 50:50 mixture of oxygen and nitrous oxide, and sevoflurane. Three litres of crystalloid were given. A small amount of ephedrine and metaraminol was also administered. Morphine was given towards the end of the operation for postoperative pain relief. The operation lasted 2 h and 37 min. On waking, the patient noticed that he could not see from his left eye and examination at that time demonstrated no perception of light. Ophthalmological review showed that the intraocular pressure was normal but the retina was white, the arteries were attenuated, and a gas bubble was still present. There was no significant blood loss or prolonged hypotension during the vascular surgery that could have caused the visual loss. The patient was diagnosed with central retinal artery occlusion secondary to bubble expansion during general anaesthesia. In the following 3 months, his vision has improved slightly to hand movements only in the left eye. The optic disc has become pale and the arteries remain very attenuated. As a consequence of this event and his diabetic retinopathy, he no longer reaches the legal limit of vision for driving in the UK.

**Discussion**

A variety of different gases are used by retinal surgeons but C3F8 is the longest lasting of those commonly used. It is often used in more complex retinal cases where longer-term tamponade of the retina is required. Its poor water solubility means that absorption from the eye is slow and residual bubbles have been observed 70 days following surgery. In contrast, nitrous oxide is highly soluble. During general anaesthesia using nitrous oxide, the nitrous oxide will enter the intraocular gas bubble more rapidly than the C3F8, SF6 or air disappears, causing the intraocular gas bubble to expand. The speed and extent with which the bubble expands will overcome the eye’s own mechanisms of controlling the intraocular pressure, and if the pressure rise is sufficient blood flow in the central retinal artery will be compromised. Primate models indicate that irreversible retinal damage occurs after 100 min of retinal artery obstruction and thus some recovery can only be expected following shorter anaesthetics. Once nitrous oxide administration is stopped, the tissue levels rapidly decrease and thus the bubble shrinks causing the intraocular pressure to return towards normal.

Patients who have intraocular gas inserted should be advised of the risks of general anaesthesia whilst the gas bubble remains, and should be told to warn the anaesthetist if they are undergoing a subsequent general anaesthetic. It would also be advisable to use alternative agents to nitrous oxide. Air should be used as a carrier gas during anaesthetics. Once nitrous oxide administration is stopped, the tissue levels rapidly decrease and thus the bubble shrinks causing the intraocular pressure to return towards normal.

Patients who have intraocular gas inserted should be advised of the risks of general anaesthesia whilst the gas bubble remains, and should be told to warn the anaesthetist if they are undergoing a subsequent general anaesthetic. It would also be advisable to use alternative agents to nitrous oxide. Air should be used as a carrier gas during anaesthetics. For any patient who has undergone vitreoretinal surgery within the preceding 3 months, unless the notes are available and confirm that either intraocular gas was not used or that it has subsequently been completely reabsorbed. In our hospital, we have now introduced ID bracelets that are placed on the patient’s wrist at the time of intraocular gas insertion, and are only removed once an ophthalmologist has seen them.
determined that the gas has been fully absorbed. This idea has been suggested previously. It is intended to help prevent the use of nitrous oxide not only in elective surgery, but also in the event of the patient being unable to give a history before an emergency anaesthetic.\(^2\)\(^6\)

References

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