service as a speaker for Cook Medical but has not received any payment for research, development, or evaluation of the CBD.

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doi:10.1093/bja/aeq221

Desaturation during Onyx embolization

Editor—The Onyx Liquid Embolic System (Onyx; Micro Therapeutics, Inc., Irvine, CA, USA) is a new non-adhesive liquid embolic agent and is currently being used at our institution in the embolization of cerebral vascular lesions.1 The disadvantage of Onyx is that it is dissolved in dimethyl sulphoxide (DMSO). Systemic toxicity, such as pulmonary oedema, bronchospasm, bradycardia, and even cardiac arrest, has been a major concern because of the action potential reducing effects of DMSO.2 There are reports regarding the use of Onyx in the treatment of arteriovenous malformations (AVMs) and dural arteriovenous fistulas (DAVFs) from the operative point of view, but there is little on the anaesthetic experience.3–6 This is the first study in a large number of patients undergoing embolization on the effect of Onyx injection on the anaesthetic management and oxygenation.

This retrospective study included 69 patients, 10–73 yr old treated with Onyx embolization for AVMs and DAVFs during 1 yr (January–December 2008). None of these patients had any significant cardiac, pulmonary medical history, or current problems.

General anaesthesia was induced with propofol 2 mg kg\(^{-1}\), fentanyl 2 \(\mu\)g kg\(^{-1}\), and cisatracurium 0.15 mg kg\(^{-1}\) and maintained with remifentanil and sevoflurane or propofol in 50% \(\text{O}_2/\text{N}_2\text{O}\) mixture. Ventilation was maintained to achieve end-tidal \(\text{FiO}_2\): 4.0–4.7 pKa. Changes in haemodynamic parameter variables by more than 20% from the pre-induction baseline values were considered significant.

Immediately after extubation, all patients received supplemental oxygen, 5 litre min\(^{-1}\), by a facemask.

In total, 23 patients had desaturation intraoperatively: 17 by 1–3% and six by 4–8% from baseline. All the episodes of desaturation happened 3–7 min after the initiation of infusion of DMSO, lasted for about 10 min and then \(\text{SpO}_2\) returned to baseline without any clinical intervention. No significant haemodynamic changes were observed that could be attributable to DMSO infusion. In a patient with a giant AVM, we observed severe desaturation (\(\text{SpO}_2\): 89%, \(\text{PaO}_2\): 8.1 kPa) 10 min after extubation, accompanied by tachypnoea. Over the course of 20 min, the patient’s oxygen saturation gradually improved to 97% (\(\text{PaO}_2\): 10.3 kPa) and 20 min later the patient met discharge criteria from the post-anaesthesia care unit. Figure 1 presents graphically the \(\text{SpO}_2\) changes.

In most cases, desaturation was clinically insignificant. In one case of severe desaturation, the patient did not develop acute respiratory distress syndrome (ARDS) or pulmonary oedema. It is known that most of the DMSO metabolites are eliminated through the kidneys, but some of the early elimination occurs via the skin or lungs. This may cause a relative decrease in the partial pressure of oxygen in the alveoli in the intraoperative and postoperative period. Other potential causes of desaturation include diffusion difficulties at the level of alveolar-capillary membrane such as intrapulmonary shunt, ventilation/perfusion mismatching, or even

![Fig 1 Graphical presentation of \(\text{SpO}_2\) alterations before and after Onyx injection in 24 patients who presented desaturation.](https://academic.oup.com/bja/article-abstract/105/3/385/251845/Desaturation-during-Onyx-embolization/385)
dead-space ventilation, as suggested in a case of postoperative ARDS after Onyx embolization of an AVM which the authors proposed was caused by the excretion of DMSO via the lungs.⁷ Oxygen desaturation after embolization of aneurysms using Onyx in the early postoperative period has been reported.⁶ It has been suggested that DMSO is unlikely to be responsible for desaturation after its administration because the amount of DMSO metabolized to dimethyl sulphide is too small (1–3% of 10 ml DMSO is metabolized to dimethyl sulphide 100–300 mg which is exhaled over several days, with a peak at 12 h).³ However, this long-lasting pharmacokinetic characteristic of DMSO may support our hypothesis that DMSO does not cause toxic side-effects, if used appropriately.

Conflict of interest
None declared.

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doi:10.1093/bja/aeq222

Self-citation in anaesthesia and critical care journals: introducing a flat tax

Editor—Peer assessment of ‘impact’ in medical research is often unclear and difficult to establish. In recent years, publication-based ‘impact factor’ has been increasingly used to assess and quantify the quality of a given journal and estimate its total scientific impact. Impact factor (IF) is calculated by dividing the number of all current citations of source items from a journal during the previous 2 yr by the total number of articles published in that same journal during those 2 yr. Frequent self-citation can affect the IF of a journal. This phenomenon is widespread and has already been noted by other authors.⁵

We have analysed the self-citation trend of all 41 IF journals listed under anaesthesia and critical care and its effect on IF. The Journal Citation Reports® (JCR®) of ISI Web of KnowledgeSM database was searched for journals with a 2008 IF included in the subject categories ‘Anaesthesiology’ (22 journals) and ‘Critical Care Medicine’ (21 Journals) giving a total of 41 journals seeing as only two journals officially belonged to both categories. We retrieved data from January 1, 1999, to January 1, 2009, for each journal, and extracted the following information: title, impact factor, impact factor without self-citation, number of papers published per year, total number of citations received per year, and number of self-citations per year.

From these data, we calculated the self-citation rate for each year (ratio of a journal’s self-citation to the number of times it is cited by all other journals).² The median percentage of self-citation in the 10 yr study period increased slightly during the first 8 yr (from 6.6% in 1999 to 11.5% in 2006, P=0.2), and dramatically increased thereafter (21% in 2007 and 44.4% in 2008, P<0.001) (Fig. 1).

![Fig 1 Self-citation rate per year: median value with 25th and 75th percentile.](https://academic.oup.com/bja/article-abstract/105/3/385/251845/Desaturation-during-Onyx-embolization/471)