Occupational asthma and allergy to sevoflurane and isoflurane in anaesthetic staff


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Isoflurane has caused contact dermatitis in an anaesthetist (1), and dermatitis is common in anaesthetic workers (2). However, there are no prior reports of occupational asthma. We report three cases with occupational asthma, work-related angioedema or dermatitis to isoflurane (1-chloro-2,2,2-trifluoroethyl difluoromethyl ether) and sevoflurane (fluoromethyl 2,2,2-trifluoro-1-(trifluoromethyl) ethyl ether) with positive specific bronchial provocation testing. All worked as anaesthetic assistants or nurses in the same hospital.

Bronchial provocation testing: Sequentially increasing exposures to sevoflurane and isoflurane were delivered on separate days via mask attached to an air driven anaesthetic machine delivering isoflurane or sevoflurane. Sequential exposures of three (0.25%), five (0.25%) and 7–10 breaths (0.37–0.5%) were given after 10 min intervals, provided that the forced expiratory volume 1 (FEV₁) was within 15% of baseline. On separate days indirect exposures were made allowing 1 ml of 100% sevoflurane or isoflurane to evaporate in a 6 m³ challenge chamber over 1 h. Post-challenge FEV₁ was monitored for 12 h.

A drop in FEV₁ of 15% over control (Shield cleaner used at work) was considered significant. Methacholine reactivity was measured by the Yan method (normal > 2000 μg).

Case 1: Work-related breathlessness, wheeze, chest tightness, rhinitis and eye irritation developed after a latent interval of 4 years of using isoflurane and sevoflurane. Her breathlessness would start within minutes of entering the operating theatres, worsen during her shift and improve after leaving work, then waking her 2–3 times from sleep. Symptoms improved during days away from work and on holidays. She had four previous general anaesthetics without incident. Analysis of two hourly peak flow records using the OASYS-2 [computer software program that uses discriminant analysis to compute a score between 1 and 4 indicating the likelihood of a Peak Expiratory Flow record showing an occupational effect (3)] showed clear evidence of occupational asthma (OASYS-2 score = 4). Figure 1 shows a 32% late asthmatic reaction following 15 breaths of isoflurane. Sevoflurane 18 breaths resulted in a 16% FEV₁ fall from baseline at 10 h (control 11%); Methacholine PD₂₀ developed from >4800 to 2127 μg postisoflurane challenge. She subsequently had an anaphylactic reaction to sevoflurane during general anaesthesia. Occupational asthma resolved following relocation to a psychiatric unit where only intravenous anaesthetics were used for electroconvulsive therapy. She has later retired on medical grounds.

Case 2: She developed wheeze and breathlessness 17 years after first starting work using isoflurane and sevoflurane in operating theatres. Serial peak flows showed only very small work related changes (OASYS score 2.17). Challenge testing to 18 breaths was negative for sevoflurane and equivocal for isoflurane (15% fall at 8 h) but indirect exposure to sevoflurane resulted in a 14% late asthmatic reaction with a significant change in Methacholine PD₂₀ from 2400 to 900 μg. Relocation to the coronary care unit abolished her work-related symptoms.

Case 3: She developed skin rash and facial swelling 3 years after starting theatre work, often accompanied by chest tightness. There was no change in FEV₁ following any challenge but exposure to isoflurane was followed by an itchy rash after both direct and indirect methods. Methacholine reactivity increased from >4800 to 1745 μg. She remains well after relocation to preoperative assessment.
Sevoflurane and isoflurane are recommended for inhalational anaesthesia in patients with a history of asthma due to their bronchodilating properties (4, 5). The department from which all three workers came carried out a high number of gas inductions, particularly in children. Scavenging during operations was in place, but difficult to achieve during gas induction, and was not attempted when the anaesthetic gases were being exhaled by patients during recovery. The subsequent anaphylactic reaction following sevoflurane anaesthesia in the first worker, despite an equivocal challenge, suggests that larger doses during BPT might have been appropriate.

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