

Surgery in a patient allergic to ethylene oxide

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To the editor—Ethylene oxide (EO), an alkylating compound of high chemical reactivity, is widely used as a sterilisation gas for various medical devices (MD) that are heat-sensitive. This type of sterilisation can cause rare but severe allergic reactions in sensitive patients. Allergic manifestations such as hives/rash, asthma or anaphylactic shock have been noted among patients in repeated contact with EO-sterilised MD. Widespread hypersensitivity to EO has also been documented in numerous dialysis patients [1, 2]. Allergic reactions to EO-treated products have also been described in several children with spina bifida [3]. The high prevalence of sensitisation to EO, and the frequency, unpredictability, and potential danger of anaphylactic reactions to EO have led to the conclusion that EO sterilisation of dialyzers should be discontinued, since alternative modalities of sterilisation are currently available. However, in spite of the progressive desorption

of EO after prolonged storage times, residual EO is still detectable in the milligram range. Even though intraoperative rinsing with physiological saline reduced the residual level of EO [4, 5], this approach has not been validated and so safety cannot be guaranteed for the sensitive/allergic patient.

This account describes the case of a patient (born 1983) suffering from myelomeningocele (spina bifida cystica) with an Arnold–Chiari malformation; the patient underwent major surgery on several occasions. During minor surgery in 1996 to treat bedsores, the patient developed a rash with complications—Quincke’s oedema. RAST measurement of the specific IgE revealed a level-4 allergy to EO, and the absence of allergy to latex. In 1997 an operation to decompress the occipital hole was planned. Benzalkonium chloride was used to prepare the patient’s skin. Anaesthetic induction was performed with inhaled sevoflurane (Sevorane[®]) followed by injections of thiopental (Nesdonal[®]), sufentanyl (Sufenta[®]) and vecuronium bromide (Norcuron[®]). The anaesthetic was maintained by isoflurane (Isoflurane[®]) and continual perfusion of sufentanyl. Perfusion of hydroxyethylamidon (Elohes[®]) was commenced 15 min after anaesthetic induction to moderate hypotension. After 25 min a silicone urinary catheter was placed with latex gloves. A pubic rash then appeared; it became general, and was rapidly followed by cardiovascular collapse. Hemodynamics were restored by continuous adrenaline perfusion. Plasma measurements of histamine and tryptase confirmed anaphylactic shock. Specific IgE measurements of the products used during the induction and maintenance of the anaesthetic were undertaken. The results were negative and therefore did not favour allergic reactions to the anaesthetics and narcotics. Based on these results, and given the chronology of events,

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the cause of shock appears to have been the placement of a urinary catheter sterilised with EO.

In 2002, the patient was admitted to hospital for a testicle tumorectomy after suspicion of cancer. A subsequent operation was then performed with a strict EO-free protocol in the presence of histamine 1 and 2 receptor antagonists. On this occasion, the intraoperative course was uneventful.

When an in-patient has been documented as being allergic to EO and must undergo surgery, there must be collaboration between all health professionals—doctors, surgeons and pharmacists—to ensure quality care is provided for the patient in full knowledge of the risks involved. Much work was performed by the medical staff to list all of the medical equipment needed before and during operations, as well as in the recovery ward. The pharmacy contacted suppliers in order to obtain radio- or autoclave-sterilised MDs. However, it is often difficult (if not impossible) to obtain all of the MDs requisitioned for complex surgical operations when they all must be sterilised without using EO. In the absence of alternatives for some types of equipment (sutures, drains), the surgical approach itself was modified before undertaking the operation. A few medically clean MDs were then also chosen (Guedel cannula for example) for use instead of sterilised MDs.

Conclusion

In case of an allergy for ethylene oxide, surgery must be planned far in advance, if possible. Time is needed to select and prepare all equipment needed for the operation. In this particular case the operation took place without incident. A list of non-EO-sterilised MDs is available on request. This allows EO-allergic patients to be cared for under optimal conditions.

Reference

1. Ebo DG, Bosmans JL, Couttenye MM, Stevens WJ. Haemodialysis-associated anaphylactic and anaphylactoid reactions. *Allergy* 2006;61(2):211–20.
2. Purello D'Ambrosio F, Savica V, Gangemi S, Ricciardi L, Bagnato G, Santoro D, Cuzzocrea S, Bellinghieri G. Ethylene oxide allergy in dialysis patients. *Nephrol Dial Transplant* 1997;12:1461–3.
3. Moneret-Vautrin DA, Mata E, Gueant JL, Turgeman D, Laxenaire MC. High risk of anaphylactic shock during surgery for spina bifida. *Lancet* 1990;335(8693):865–6.
4. Kaku N, Tsumara H, Kataoka M, Taira H, Torisu T. Influence of aeration, storage and rinsing conditions on residual ethylene oxide in freeze-dried bone allograft. *J Orthop Sci* 2002;7:238–42.
5. Ansorge W, Pelger M, Dietrich W, Baurmeister U. Ethylene oxide in dialyzer rinsing fluid: effect of rinsing technique, dialyzer storage time, and potting compound. *Artif Organs* 1987;11:118–20.