

## An unusual cause of carbon dioxide rebreathing in a circle absorber system

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To the Editor:

Hypercapnia while using a circle absorber system is a known complication. The main reasons of hypercapnia due to rebreathing are exhausted soda lime, malfunctioning unidirectional valves and chamber bypass. We report an unusual cause of chamber bypass causing hypercapnia due to rebreathing.

A 30-year-old male patient with a history of a road traffic accident was posted for emergency decompressive craniotomy. Routine check of the anaesthesia machine (in accordance with the recommended pre-anaesthetic check list) was performed. General anaesthesia was administered and maintained using a circle absorber system at low flows (1 l/min). Standard monitoring was performed, and levels were within normal limits. Twenty minutes later, the  $\text{FiCO}_2$  gradually increased from 0 to 15 mmHg, and the  $\text{EtCO}_2$  increased from 34 to 50 mmHg with a rebreathing pattern on the capnograph. The soda lime in the canister did not show any colour change, and the unidirectional valves were confirmed to be functioning normally. The fresh gas flows were increased (5 l/min), and manual ventilation was initiated. On closer inspection of the soda lime canister, one of the three rings on which the inner chamber of soda lime canister is seated was found to be

missing (Fig. 1). With replacement of the rubber ring, the  $\text{FiCO}_2$  and  $\text{EtCO}_2$  normalized.

The anaesthesia machine which was being used had been in service for 3 years, and periodic checks were carried out by a maintenance engineer authorised by the company. The circle absorber breathing system used in our patient contained a single chamber of soda lime surrounded by an outer chamber. In such a system, the exhaled gases pass from above, downwards through the soda lime, then further through the holes at bottom of the inner chamber to the space between the outer chamber and inner canister and finally below and then upwards (Fig. 2). In our case, the absence of the rubber ring caused the gases to escape to the outer chamber, thereby bypassing the soda lime and resulting in  $\text{CO}_2$  rebreathing. The rubber ring was displaced during the change of soda lime or cleaning of the canister; as such it was a human error. The operation theatre technicians have since been specifically instructed to be careful during their handling of the soda lime assembly in the future in order to prevent further potential mishaps. In addition, the anesthesia residents have been made aware of the possibility of a poorly positioned rubber ring in the soda lime canister if other common causes of  $\text{CO}_2$  rebreathing and hypercapnia has been clinically excluded. Such realignments can occur despite routine checks of the anaesthesia machine. The manufacturer of the machine has also been informed of this incident with the displaced ring in the soda lime assembly, and we have suggested the possibility of permanent fixation of the ring as this would avoid this inadvertent complication. However, permanent fixation may make cleaning of the canister tedious owing to the collection of moisture.

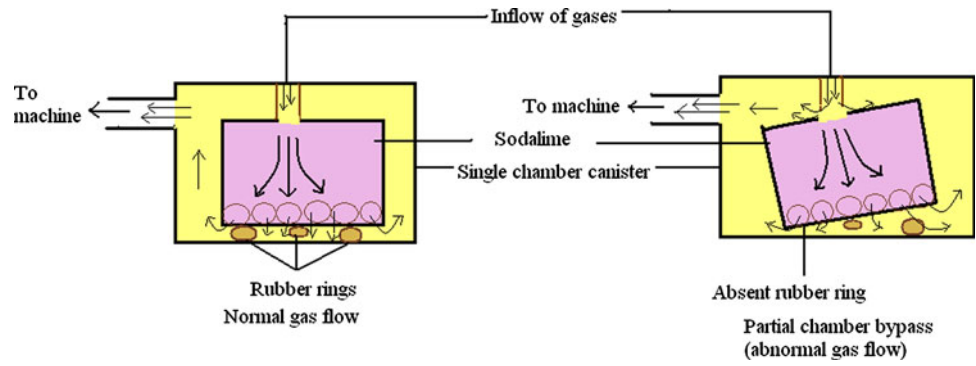
Problems have been encountered with the double canister soda lime assembly in which the sealing ring between the two canisters was displaced [1, 2]. We report this case

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**Fig. 1** Absent rubber ring on which the inner chamber rests



**Fig. 2** Diagram of gas flows in single chamber canister

to stress the necessity of vigilance for different possible causes of CO<sub>2</sub> rebreathing while working with a circle absorber system using low flows.

**References**

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