Another utility of signature capnogram: Detection of sodalime canister detachment from anesthesia machine

Sir,

Capnography is the continuous carbon dioxide (CO$_2$) level monitoring along with its graphical representation during the respiratory cycle. CO$_2$ rebreathing during general anesthesia is defined as an increased inspired pressure of carbon dioxide above 2 mmHg.[1] The “Signature capnogram” is a type of rebreathing capnogram during the inspiratory phase of the respiratory cycle. It has been already reported in the case of rebreathing with Bain circuit assisted positive pressure ventilation and totally exhausted CO$_2$ absorbent.[2,3]

We like to report the similar signature capnogram during total disconnection of single chambered absorbent canister from the anesthesia machine Datex ohmeda S/5 Avance (Datex-Ohmeda, P.O. Box 7550, Madison WI, 53707-7550, USA).

A 30-year-old, 50 kg female with fibroadenoma of right breast was posted for excision. Patient was induced with fentanyl 3 µg/kg and propofol 2 mg/kg after starting

![Figure 1](image1.png)

Figure 1: Properly attached single chambered sodalime canister with Anesthesia machine (Datex ohmeda S/5 Avance machine) at both ends leaving no gap between them

![Figure 2A](image2a.png)

Figure 2a: Canister hanging at 45° from hinge point because of detachment from other end and disconnection between inlet and outlet of canister and the machine
standard anesthesia monitoring on Datex ohmeda S/5 Avance anesthesia machine. Orotracheal intubation was facilitated by vecuronium 0.08 mg/kg and mechanical ventilation started. Anesthesia was maintained with 50% air-oxygen mixture and propofol infusion at the rate of 100-200 µg/kg/min. The patient was hemodynamically stable. Capnography was under normal range with EtCO₂ value of 36 mmHg and zero inspiratory level. In our center, we do change soda lime at a regular interval. This time anesthesia technician came to replace the exhausted CO₂ absorbent with the fresh one during this operation. We took the patient on manual positive pressure ventilation during changing of soda lime. Technician removed the absorbent canister after detaching it. He reattached the canister after putting fresh soda lime in it [Figure 1]. Capnography was normal after attaching the canister for 10 min, but gradually EtCO₂ started increasing with raised inspiratory level with an inspiratory peak. The expiratory and inspiratory valves were changed, but abnormal capnogram was still persisting. Rebreathing continued to be apparent. Meanwhile, we found that absorbent canister containing fresh soda lime was hanging from the anesthesia machine making an angle of 45° with the horizontal axis thereby inlet and outlet point of canister were not connected to corresponding outlet and inlet in the machine [Figure 2a]. After proper attachment, this abnormal (signature) capnogram disappeared to normal capnogram after 3 min. Possibilities are that canister and machine could not be attached properly or loosely attached to each other but their inlet and outlet were enough connected to allow gas passage through CO₂ absorbent to absorb CO₂ giving normal capnogram. After 10 min canister could have detached totally at loose end from the machine but other end was still attached from the machine at 45° from horizontal. In this position, inlet and outlet of the canister were so far from corresponding outlet and inlet of the machine causing automatic closure of valve at the corresponding point in the machine resulting in bypass of exhaled CO₂ enriched gas. This exhaled CO₂ rich gas collects at the patient end of the inspiratory limb and predominantly fresh gas (gases collected during expiratory pause resulting in further decrease of CO₂ concentration) collects at the machine end of the inspiratory limb to produce relative differences in the CO₂ concentration in the inspiratory limb during inspiration. This inspiratory CO₂ differences results in inspiratory peak followed by an inspiratory dip in CO₂ level producing a signature wave in the inspiratory phase of capnography [Figure 2b].

After a scientific literature search, we did not find such unusual reporting and its detection with the help of capnogram. “Signature capnogram” would be one of the methods to timely detect the disconnection of CO₂ absorbent from anesthesia machine thereby preventing and managing intraoperative adverse respiratory events leading to catastrophe. We are reporting another valuable utility of capnography by displaying signatures capnogram in our case where soda lime canister was disconnected from the Datex ohmeda S/5 Avance machine. Further studies are required in this field.

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Conflicts of interest
There are no conflicts of interest.

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