Malfunction of adjustable pressure limiting valve

Sir,
It is mandatory to check the breathing system before the administration of anesthesia. In the modern machines, this check is done automatically by the machine as a preanesthesia checkout including a leak test.

The failure of anesthesia circuit intraoperatively can be a relatively rare event after automated checkout. Such incidences have been reported due to disconnection, breakage, or malfunction of any component of the circuit.

We report a complete manual ventilation failure due to temporary malfunctioning of adjustable pressure limiting (APL) valve.

We report a case conducted on Dräger Primus, where manual ventilation failed intraoperatively. As per the routine practice, the machine had cleared self-test before the anesthesia was conducted. Patient has undergone lumbar decompression under general anesthesia (induction: propofol 2 mg/kg and fentanyl 2 mcg/kg; muscle relaxation: rocuronium bromide 0.6 mg/kg; orotracheal intubation; maintenance: sevoflurane in oxygen anesthesia with controlled ventilation) in the prone position. Before the surgical closure, the surgeon requested for a Valsalva maneuver to check for the dural integrity. Hence, the ventilation was taken over on manual mode, and we tried to ventilate manually at a fresh gas flow of 1 L/min with APL closed at 20 cm of water. The reservoir bag did not fill, and hence we further increased the fresh gas flow (FGF) to 4 L/min and the APL was closed to 70 cm of water. The reservoir the bag did not fill even with the closed valve which alerted us about the circuit leak. Meanwhile, the patient was again placed on controlled mode of ventilation. With the controlled mode, the patient was adequately ventilated without any circuit leak. While looking for the leak site, we found that the gas sample line was coiled around the APL valve, with a part of the line trapped between the control knob and the base of the APL valve. Thus, the APL valve was not closing completely to allow the reservoir bag to fill [Figure 1]. On controlled ventilation, the patient was getting ventilated as the APL valve is bypassed. After releasing the sample line, the APL valve could be closed, and we could manually ventilate the patient.

After thorough search of literature, we found that few such incidences have been reported where trapped temperature monitoring line[1] and CO$_2$ sample line[2] had caused malfunction of the APL valve in the Drager workstation. Kibelbek[1] reported two cases where trapped temperature cable or CO$_2$ sampling line below the APL valve caused its malfunction. Similarly, Vijayakumar et al.[2] reported the trapping of the CO$_2$ monitoring line below the APL valve causing the malfunction of the circuit. Kibelbek[1] suggested that this can be overcome by adding a skirt or lip to the APL knob extending over the base of the valve that may prevent foreign objects from becoming wedged between the knob and the base. Clark[3] and Karchner[4] of the Draeger Medical Inc. suggested the use of area beneath the breathing system mounting arm to route lines and cables to avoid such events. One can also use a boom arm that is provided as an accessory that can assist the user in cable management. He also highlighted the warning in the Operator’s Instruction Manual which mentions to route all lines and cables away from the APL valve knob to prevent interference.

We reported this case to convey that automated preanesthesia checkouts are not full proofs. The integrity and the
functionality of the anesthesia machines and circuits need to be vigilantly monitored by the anesthesiologists timely to avoid such catastrophes. We should keep the vicinity around APL valve clear and free of any tubings or loose wires, thus avoiding its malfunction. We would suggest that the working manual of all the equipment should be handy and read by the anesthesiologist to overcome the trouble shooters.

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Conflicts of interest
There are no conflicts of interest.

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