Response from the manufacturer to Shah, B. and Peiris, K.,
regarding their correspondence "Dräger Ventilator—Ventilates without Fresh Gas Flow"

Sir,

We as Drägerwerk AG & Co KGaA would like to make several comments to the published letter from Dr B. Shah et al.1 regarding Dräger Ventilator.

In this letter, a case is described where an anesthesia machine, which is equipped with an optional available auxiliary common gas outlet (ACGO), is used. In the described specific case, anesthesia has been provided initially by using a T-piece breathing system which was connected to this ACGO. Later on, the anesthesia provider decided to switch to automatic ventilation with the standard circle system. The steps to switch over from ACGO mode to automatic ventilation mode are described in the Instructions for Use of the Fabius Tiro.2

However, in this case, the anesthesia providers did not follow the Instructions for Use completely, with the result that the anesthesia machine did not correctly ventilate the patient. In order to better explain what happened, we would like to describe the functional principle of this specific anesthesia machine:

When the machine is switched to ACGO mode, the fresh gas, enriched with the anesthesia agent from the vapor, is directly guided from the ACGO outlet of the Ventilator through the T-piece breathing system and connected to the patient.

Switching the machine to automatic ventilation is a two-step approach and is described in the Instructions for Use of the Fabius Tiro.2

In this specific case described by Dr Shah, the anesthesia provider did not switch the anesthesia machine completely to automatic ventilation as described in the Instructions for Use.1 The fresh gas was still delivered to the ACGO outlet of the machine while the patient was connected to the circle system. Therefore no fresh gas was delivered to the patient.

In such a situation, the patient is ventilated with room air. This is part of the safety system of the Fabius anesthesia machine; the device is designed to continue ventilation even in the case of fresh gas problems (ie, problems with central gas supply or cylinder is empty). In order to alert the user of such a situation, the anesthesia machine will alarm with the insp O2 low alarm (high priority alarm). The anesthesia provider has to set patient-specific alarm limits to get this alarm at the right time. Furthermore, additional low MAC and low agent alarms from the mandatory CO2 and agent monitoring would further alert the user of the incorrect set up.

By investigating this specific case described by Dr Shah et al., we did not find any details how FiO2 measurement had been connected to the T-piece breathing system nor how CO2 or volatile agent concentration have been measured. In their letter, they described the low FiO2 Alarm factory limit as 18%. This is not correct: factory standard of the integrated FiO2 monitoring of the anesthesia machine is 20% and can be configured in the set up of the device to a different default value. According to the Instructions for Use, the specific alarm limits should be adapted per patient and is a clinical decision. Furthermore, Dr Shah et al. mentioned that the low MAC values have been correctly displayed but ignored by the user and low MAC alarms have been disabled.

The AAGBI as the occupational society for British Anesthesiologists has published a Safety Guideline in 2015 in which “Recommendations for Standards of Monitoring during Anesthesia and Recovery” are laid down. Especially the meaning of adequate FiO2 monitoring is underlined therein.

Overall this article emphasizes how important it is to:

1. make yourself familiar with the use of a specific anesthesia machine (appropriate training) before using the machines with patients
2. follow the instructions of the user’s manual of the specific anesthesia machine in order to be able to provide safe anesthesia
3. utilize the mandatory patient monitoring (FiO2, CO2, agent) to provide safe anesthesia
4. set the alarm limits according to the patient needs
5. pay attention to alarms of the anesthesia machine

DISCLOSURES

Both authors are employees of the manufacturer, Drägerwerk AG & Co KGaA, Lübeck, Germany.

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Comment on hybrid stage I management in: Anesthesia for high-risk procedures in the catheterization laboratory, an educational review by Daaboul DG, DiNardo J, and Nasr V

Dear Editor,

We would like to thank the authors for this excellent overview on the anesthesiological care during catheter interventions in children with congenital heart defects published in Pediatric Anaesthesia.1

In the section on hybrid therapy in patients with hypoplastic left heart syndrome (HLHS), however, it should be pointed out that this procedure is carried out very differently throughout the world. In many centers, in addition to surgical bilateral banding of the pulmonary arteries (bPAB), a reverse Blalock-Taussig shunt is used or the ductus arteriosus (DA) is transpulmonary stented during the same procedure. In addition to patients’ risk factors, often more prevalent in the hybrid patients,2,3 this could be the reason for the poorer results in some centers compared to Norwood stage I with right ventricle to pulmonary artery shunt.

In many patients, the DA stenting can be performed as a separate procedure after surgical bPAB using a transfemoral access. Until then, the prostaglandin E2 infusion will be continued (Giessen hybrid stage I approach). This minimal handling approach is associated with an operative hybrid stage I mortality of 2.5%4 and an overall 15 year survival rate of 78% in specialized centers. A birth weight <2.5 kg has no negative influence on the outcome using this approach.5

CONFLICT OF INTEREST

The authors report no conflict of interest.

ETHICAL APPROVAL

No ethical approval was necessary for this correspondence as there is no patient information revealed.

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REFERENCES

1. Shah B, Peiris K. Dräger Ventilator - Ventilates without Fresh Gas Flow. Pediatr Anesth. 2019. https://doi.org/10.1111/pan.13631.
2. Drägerwerk AG & Co. KGaA. Fabius Tiro - Instructions for Use, 9054601 – GA 6020.002 en. Lübeck, Germany: Drägerwerk AG & Co. KGaA;2014.

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References

1. Daaboul DG, DiNardo JA, Nasr VG. Anesthesia for high-risk procedures in the catheterization laboratory. Pediatr Anesth. 2019;29:491–498.
2. Pizarro C, Derby CD, Baffa JM, Murdison KA, Radtke WA. Improving the outcome of high-risk neonates with hypoplastic left heart syndrome: hybrid procedure or conventional surgical palliation? Eur J Cardiothorac Surg. 2008;33:613–619.
3. Karamlou T, Overman D, Hill KD, et al. Stage 1 hybrid palliation for hypoplastic left heart syndrome—assessment of contemporary patterns of use: an analysis of the society of thoracic surgeons congenital heart surgery database. J Thorac Cardiovasc Surg. 2015;149(1):195–202.e1.
4. Yerebakan C, Valeske K, Elmontaser H, et al. Hybrid therapy for hypoplastic left heart syndrome: myth, alternative, or standard? J Thorac Cardiovasc Surg. 2015;151:1112–1121.
5. Yörüker U, Akintürk H. Giessen procedure as comprehensive stag II palliation with aortic arch reconstruction after hybrid bilateral pulmonary artery banding and ductal stenting for hypoplastic left heart syndrome. Sem Thorac Cardiovasc Surg Pediatr Card Surg Ann. 2017;21:19–27.