rehabilitation in COVID-19 patients recovering from acute respiratory failure: results of a Delphi process. Monaldi Arch Chest Dis. 2020;90(2):385–93, http://dx.doi.org/10.4081/monaldi.2020.1444.
3. Choon-Huat Koh G, Hoenig H. How should the rehabilitation community prepare for 2019-nCoV? Arch Phys Med Rehabil. 2020;101(6):1068–71, http://dx.doi.org/10.1016/j.apmr.2020.03.003.
4. Belli S, Balbi B, Prince I, Cattaneo D, Masocco F, Zaccaria S, et al. Low physical functioning and impaired performance of activities of daily life in COVID-19 patients who survived hospitalisation. Eur Respir J. 2020;56(4):2002096, http://dx.doi.org/10.1183/13993003.02096-2020.
5. Curci C, Pisano F, Bonacci E, Camozzi DM, Ceravolo C, Bergonzi R, et al. Early rehabilitation in post acute COVID-19 patients: data from an Italian COVID-19 rehabilitation unit and proposal of a treatment protocol. A cross-sectional study. Eur J Phys Rehabil Med. 2020;56(5):633–41, http://dx.doi.org/10.23736/S1973-9087.20.06339-X.6.
6. Ippolito M, Vitale F, Accurso G, Iozzo P, Gregoretti C, Giarratano A, et al. Medical masks and respirators for the protection of Healthcare Workers from SARS-CoV-2 and other viruses. Pulmonology. 2020;26(4):204–12, http://dx.doi.org/10.1016/j.pulmoe.2020.04.009.
7. Bernabeu-Mora R, Medina-Mirapeix F, Llamazares-Herrán E, García-Guillamón G, Giménez Giménez LM, Sánchez-Nieto JM. The short physical performance battery is a discriminative tool for identifying patients with COPD at risk of disability. Int J Chron Obstruct Pulmon Dis. 2015;10:2619–26, http://dx.doi.org/10.2147/COPD.S94377.
8. Bui KL, Nyberg A, Maltais F, Saey D. Functional tests in chronic obstructive pulmonary disease, part 2: measurement properties. Ann Am Thorac Soc. 2017;14(May (5)):785–94, http://dx.doi.org/10.1513/AnnalsATS.201609-734AS.
9. Gandotra S, Lovato J, Case D, Bakhru RN, Gibbs K, Berry M, et al. Physical function trajectories in survivors of acute respiratory failure. Ann Am Thorac Soc. 2019;16(4):471–7, http://dx.doi.org/10.1513/AnnalsATS.201806-375OC.
10. Paneroni M, Vitacca M, Venturelli M, Simonelli C, Bertacchini L, Scalvini S, et al. The impact of exercise training on fatigue in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis. Pulmonology. 2020;26(5):304–13, http://dx.doi.org/10.1016/j.pulmoe.2020.02.004.

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Non-invasive ventilation through a nasal interface during transoesophageal echocardiogram in a high-risk chronic patient

Dear Editor,

Non-invasive ventilation (NIV) has been an efficient strategy for ventilatory support and sedation related respiratory failure prevention during endoscopic procedures in high-risk patients. However, there is not enough evidence concerning the ideal pressure setting and choice of interface, mainly in home mechanical ventilated patients that have different interface options.[1]

We report the use of NIV in a high-risk chronic patient undergoing transoesophageal echocardiography (TEE) under sedation using her own home care vented nasal interface with intentional leaks (Mirage FX™, ResMed, Australia).

The patient was a 31-year-old woman, 45 kg weight, with a previous medical history of cystic fibrosis, chronic respiratory failure and end-stage kidney disease. She was on home mechanical ventilation with high ventilatory dependency (>18 h/day) in spontaneous/timed (ST) bi-level pressure cycled mode [inspiratory positive airway pressure (IPAP) of 17 cmH_2O; expiratory positive airway pressure (EPAP) of 4 cmH_2O; backup respiratory rate (RR) of 16 cpm], alternating between oro-nasal and nasal interface during sleep and daytime, respectively, continuous oxygen (O_2) therapy (2 L/min) and haemodialysis through a catheter placed in the right atrium.

She was hospital admitted due to fluid overload and fever of unknown origin. Aetiological investigation isolated a *Methicillin-susceptible Staphylococcus aureus* in blood cultures without evidence of respiratory or urinary tract infection. Transthoracic echocardiogram showed a mass in the right atrium in relation to the catheter, requiring TEE characterisation.

Monitoring during TEE included non-invasive blood pressure and pulse oximetry (SpO_2). NIV was applied with ST bi-level pressure cycled mode using an acute hospital ventilator with an O_2 blender permitting a fraction of inspired oxygen (FiO_2) of 100% (*Trilogy 202™, Philips Respironics, Pennsylvania, United States*). The interface was patient's home care vented nasal mask. Sedation was performed with intravenous midazolam — intended sedation level of -3 in the Richmond Agitation Sedation Scale (RASS).

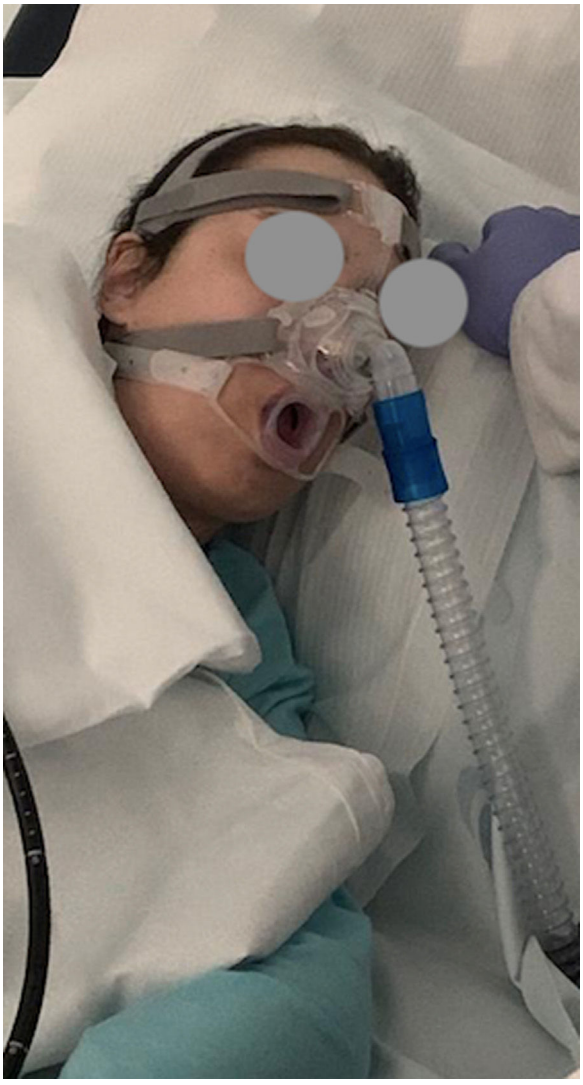

Figure 1 Mouthpiece placement for transoesophageal echocardiography probe insertion during non-invasive ventilation trough nasal mask.

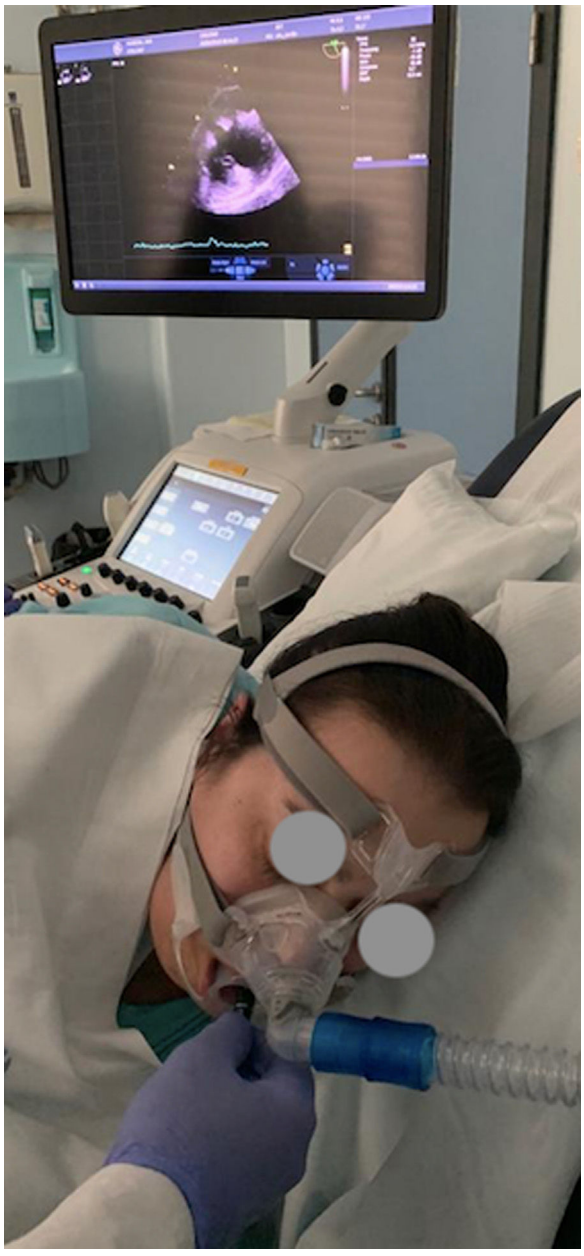

Figure 2 Transoesophageal echocardiogram performance during non-invasive ventilation trough nasal mask.

Patient was positioned in lateral decubitus and a mouthpiece was placed for TEE probe insertion (Fig. 1). Initial ventilator settings were set at 22 cmH_2O IPAP, 6 cmH_2O EPAP and 40% FiO_2 to achieve normal RR and SpO_2 > 95%. Ventilator settings and FiO_2 were adjusted in every episode of SpO_2 < 95%.

Incremental doses of 2 mg of midazolam (total 4 mg) were administered to achieve the depth of sedation. Few minutes after initiating the TEE, patient's SpO_2 decreased to 88% and a significant increase of mouth leak (>60 L) was observed. IPAP was incremented to 24 cmH_2O and FiO_2 was set first at 80% and then 100%, resulting in a SpO_2 of 100% and chest excursion throughout, even with persistent mouth leaks. TEE lasted 11 min and operators did not mention any technical difficulty. Patient remained RASS score-3 all procedure, was alert ten minutes post-procedure and tolerated it well with nasal NIV without complaints or complications. TEE revealed a thrombus in the right atrium.

Intravenous sedation is an effective way of achieving patient compliance during TTE. However, it is widely recognized that its use is associated with respiratory depression, desaturation and sometimes with respiratory failure, especially with increased sedative doses[2,3] and in chronic respiratory failure patients.[3] We describe the use of a home care nasal mask to deliver NIV during TEE in a high-risk patient and proved its effectiveness in preventing sedation induced respiratory failure. No similar report has been found in the English literature.

Air leaks through the mouthpiece were high during the procedure, which in association with the respiratory depression caused by sedation, were responsible for the desaturation episode. Nevertheless, they were effectively compensated with increment of pressure support, resulting in a SpO_2 of 100% and chest excursion throughout. When using a single tubing system and with such a large leak, the

use of tidal volume (V_{te}) for ventilatory monitoring may be misleading, since real V_{te} quantification in this situation is not possible.

The use of NIV as an adjunct to TEE has already been shown to be effective in preventing respiratory failure due to sedation. However, all reports described the use of oronasal or total-face masks.[4–6] In those cases, the endoscopic probe had to overcome a mask port before reaching the mouth. The main difficulties reported were in introducing TEE's probe due to suboptimal gliding through the mask port and excessive image attrition due to difficulties in moving the probe.[6] The use of a nasal mask had no interference in TEE probe insertion and handling (Fig. 2). Moreover, the novelty of using the patient's home care mask is considered to contribute to increased tolerance and cooperation, as she was already trained in its use.

In conclusion, we find two advantages for this approach. First, it is effective in delivering efficient ventilatory support in high-risk patients during TEE avoiding the risk of respiratory failure. Second, the choice of a home care vented nasal mask did not interfere with TEE technique. Monitoring of SpO_2 and qualitative clinical signs, such as chest excursion, can be useful for NIV optimization during the procedure.

Conflicts of interest

The authors have no conflicts of interest to declare.

References

1. Mineiro MA, Guimarães MJ, Winck JC. Organization of home mechanical ventilation in Portugal: characterization of current centers and a pathway to uniformization. Pulmonology. 2020;26(2):84–9, http://dx.doi.org/10.1016/j.pulmoe.2019.05.006.
2. Sutaria N, Northridge D, Denvir M. A survey of sedation and monitoring practices during transoesophageal echocardiography in the UK: are recommended guidelines being followed? Heart. 2000;84 Supple 2:ii19, http://dx.doi.org/10.1136/heart.84.suppl_2.ii19.
3. Nordt SP, Clark RF. Midazolam: a review of therapeutic uses and toxicity. J Emerg Med. 1997;15(3):357–65, http://dx.doi.org/10.1016/S0736-4679(97)00022-X.
4. Guarracino F, Cabrini L, Baldassarri R, Cariello C, Covello RD, Landoni G, et al. Non-invasive ventilation-aided transoesophageal echocardiography in high-risk patients: a pilot study. Eur J Echocardiogr. 2010;11(6):554–6, http://dx.doi.org/10.1093/ejechocard/jeq019.
5. Pieri M, Landoni G, Cabrini L. Noninvasive ventilation during endoscopic procedures: rationale, clinical use, and devices. J Cardiothorac Vasc Anesth. 2018;32(2):928–34, http://dx.doi.org/10.1053/j.jvca.2017.09.038.
6. Zangrillo A, Mazzone P, Votta CD, Villari N, Della Bella P, Monaco F. Prolonged transesophageal echocardiography during percutaneous closure of the left atrial appendage without general anesthesia: the utility of the Janus mask. Can J Anesth. 2016;63(8):962–5, http://dx.doi.org/10.1007/s12630-016-0659-1.

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High-flow nasal oxygen in re-expansion pulmonary oedema

Dear editor,

Re-expansion pulmonary edema (RPE) is a rare clinical condition with a low incidence rate, which normally occurs with the rapid expansion of the collapsed lung after drainage of the pleural cavity. It often manifests with acute respiratory failure, in some cases making invasive mechanical ventilation (IMV) necessary.

The authors report a case of a 49-year-old male, smoker of 20 packs per year, who went to the emergency department with fever, dyspnea, cough, purulent sputum, and right posterior pleuritic chest pain with 4 days of evolution. Physical examination revealed cachexia (BMI of 14.8 kg/m2), tachycardia, tachypnea, and decreased breath sounds in the lower half of the right lung field. Blood gas revealed type 1 respiratory failure (paO2/FiO2 223) and analyses identified leukocytosis with neutrophilia and increased inflammatory parameters (C-reactive protein 39 mg/dL, normal < 0.5 mg/dL). The chest radiograph revealed pulmonary homogenous opacification of the right lung, with obliteration of right costophrenic angle and superior concavity, compatible with pleural effusion (Fig. 1A). The thoracic computed tomography (CT) evidenced a large loculated right pleural effusion with pleural thickening, compatible with empyema (Fig. 1B), and extensive centrilobular and paraseptal emphysema with bullous dystrophy of apical predominance (Fig. 1C). For infection focus control, a 24 Fr chest tube was placed, with drainage of 2000 mL of purulent pleural fluid. The analysis of this liquid revealed leukocytes 28868/mm3, glucose < 5 mg/dL, LDH > 3100 IU/L, pH 6.0. The chest radiograph (Fig. 2A) after drainage, showed