

Military gas mask to protect surgeons when performing tracheotomies on patients with COVID-19

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Tracheotomy is frequently indicated for patients with COVID-19 suffering from severe acute respiratory syndrome (SARS). The French Army Biomedical Research Centre provided our hospital with military masks equipped with P3 filter cartridges and an integrated ventilation unit that would allow safe performance of this procedure when faced with a high risk of virus transmission (Figure 1). FFP2 or FFP3 masks can provide proper protection, as these masks have an efficiency of 95%–99% when tested with 0.30 µm particles. However, their efficacy for SARS-CoV-2 protection has not been explored, and the virus has a smaller calibre (0.1–0.15 µm).¹ An additional concern is the potential risk of progressive degradation and increasing porosity, which could explain the lower efficiency of FFP2 or FFP3 masks compared with powered air-purifying respirators.² By contrast, the gas mask, originally designed to protect soldiers against biological and chemical attacks, provides full protection. The filter in the device is comparable with an FFP3 filter and can be fully effective for hours without performance degradation. The filter and the powered air-purifying respirator are also positioned at the back of the surgeon, away from the patient's airways and from virus projection during



Figure 1 Surgeon equipped with French Army mask with P3 filter cartridges and integrated ventilation unit.



Figure 2 Surgical tracheotomy performed with military gas mask.

Key messages

- ▶ Military gas masks allow safe performance of tracheotomies when faced with a high risk of virus transmission.
- ▶ Gas masks can be useful when FFP3 masks are lacking or when operating in restricted military situations.
- ▶ Gas masks are reusable after decontamination.
- ▶ Awareness of this device and the ability to perform surgery with this procedure could be crucial during pandemics.

the trachea incision. Gas masks can be useful when FFP3 masks are lacking or when operating in restricted military situations. Gas masks are also reusable after decontamination.

Despite the use of an unaccustomed procedure, we performed 20 tracheotomies without any complications (Figure 2). Awareness of this device and the ability to perform surgery with this procedure could be crucial during the COVID-19 pandemic and might be applied in the fight against other and more aggressive viruses, such as Ebola.

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REFERENCES

- 1 Lu R, Zhao X, Li J, *et al*. Genomic characterisation and epidemiology of 2019 novel coronavirus: implications for virus origins and receptor binding. *Lancet* 2020;395:565–74.
- 2 Christian MD, Loutfy M, McDonald LC, *et al*. Possible SARS coronavirus transmission during cardiopulmonary resuscitation. *Emerg Infect Dis* 2004;10:287–93.



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