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3D-printable headlight face shield adapter. Personal protective equipment in the COVID-19 era

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ABSTRACT

The coronavirus SARS-CoV-2 (COVID-19) pandemic has pushed health workers to find creative solutions to a global shortage of personal protection equipment (PPE). 3D-printing technology is having an essential role during the pandemic providing solutions for this problem, for instance, modifying full-face snorkel masks or creating low-cost face shields to use as PPE (Ishack and Lipner, 2020 [1]).

Otolaryngologists are at increased occupational risk to COVID19 infection due to the exposure to respiratory droplets and aerosols, especially during the routine nose and mouth examinations where coughing and sneezing happen regularly (Rna et al., 2017 [2]; Tysome and Bhutta, 2020 [3]). The use of a headlight is essential during these examinations. However, to our knowledge, none of the commercially available or 3D-printable face shields are compatible with a headlight. Hence, using a face shield and a headlight at the same time can be very uncomfortable and sometimes impossible.

To solve this problem, we have designed a 3D-printable adapter for medical headlights, which can hold a transparent sheet to create a face shield as an effective barrier protection that can be used comfortably with the headlight. The adapter can be printed in different materials with the most commonly used nowadays being the cost-efficient PLA (Polylactic Acid) used for this prototype. The resulting piece weighs only 7 g and has an estimated cost of $0.15 USD. The transparent sheets, typically made from polyester and used for laser printing, can be purchased in any office material store with a standard price of 0.4 USD per unit. After use, the transparent sheet can be easily removed.

We trialed the adapter in 7 different headlights. All of these headlights accommodated the printed blocks extremely well. The headlights were used in many different settings, including the ENT clinic, the operating room, the emergency room, the ENT ward and the COVID19 intensive care unit (ICU) for a two weeks period. All doctors using the headlight felt they were fully protected from respiratory droplets, blood, sputum and other fluids. The face shield with the headlight has been found very useful for treating epistaxis, changing tracheostomy cannulas and during routine nasal and oral examinations.

The headlight face shield adapter was designed to solve a specific problem among the ENT community; however other specialist can find it useful as well. Nonetheless, manufacturers should take care of specifics problems like this and provide commercially available products to protect the ENT workforce in this new era.

1. Voice over transcript

00:00 – “We present to you a 3D printable headlight face shield adapter, created at the Marqués de Valdecilla University Hospital, Santander, Spain."

00:10 – “During the COVID-19 pandemic, otolaryngologist has been very exposed to the virus due to a high viral load in the upper respiratory track. Covering the face is essential to avoid transmissions of respiratory droplets; however, wearing a face shield and a headlight at the same time is uncomfortable”.

00:27 – “To solve this problem we’ve designed a 3D printable adapter for medical headlights that transform it into a face shield using
a transparent sheet. In order to make this you will need the following items.

00:39 – “A head light, two 3D printed adapters, a paper punch, a pair of scissors, a transparent sheet and adhesive tape”.

01:08 – “The adapter has a hole in the middle to allow you to insert the adhesive tape through it”.

01:18 – “You should attach one adapter to both sides of the headlight”.

01:35 – “Then you'll need to perforate the transparent sheet with the paper punch in the correct position”.

01:44 – “It's useful to plan ahead for the second perforation and to allow for a gap for the lamp”.

01:58 – “Once you have a hole for each 3D adapter and the middle cutout, you can assemble the face shield”.

02:13 – “As you can see, the whole face is protected from droplets”.

02:27 – “This is not only ideal to perform routine examinations but also for treating epistaxis or changing a tracheostomy cannula”.

02:48 – “After use, the shield can be easily disposed of”.

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**Appendix A. Supplementary data**

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amjoto.2020.102576.

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