Reducing potential aerosol generation in flexible nasolaryngoscopy: a novel method

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Abstract

Key Points: 1. Clinical areas where Fibreoptic nasoendoscopy (FNE) and larygoscopy (FOL) are performed are high risk areas in the COVID-19 era as they are potential aerosol generating procedures (AGP). 2. Barrier protection remains the key to prevent transmission. This device is one that patients can wear to reduce potential aerosol contamination of the surroundings. 3. Seal can be verified and tested by the patient placing a thumb over the filter. 4. This device is simple, reproduceable, easy to use, economical and well tolerated. Full personal protection equipment (PPE) is still advisable to be worn by the operator. 5. This device may reduce potential aerosolisation and thus reduce the need to allow air changes in clinic rooms, freeing up clinical resources.

Introduction

Fibreoptic nasoendoscopy (FNE) and laryngoscopy (FOL) are essential items in the Otolaryngologist's toolkit. They allow rapid diagnosis in both the emergency and elective settings. However, in the COVID-19 (Corona Virus Disease 19) era, changes to practice are necessary to protect both the patient and health-care provider. Many ENT procedures require personal protective equipment (PPE). Public Health England and ENTUK have published guidance identifying "Higher risk" clinical areas. These include areas where nasendoscopy is performed regularly (1). Moreover, ENT clinics do not have laminar airflow rooms thus room ventilation is dependent on the frequency of air changes. A standard room has 4 to 6 air changes per hour, thus a room where an aerosol generating procedure has been performed may be empty for at least an hour prior to cleaning to reduce the risk from cross contamination due to aerosols.

It is best practice to presume there is a degree of aerosolization given the concentration of virus particles in the nasal cavity and the potential to cause coughing or sneezing. FOL procedures have the potential to produce aerosols when the patient coughs, sneezes, talks, or when suction is used. Further, droplets are detectable from the patient in the air when they are speaking, which is often part of the FOL assessment (2).

Current guidance is that all persons performing an aerosol generating procedure must wear PPE consisting of a filtering face piece 3 (FFP3) mask, adequate eye protection (3), gloves and fluid resistant gown (1). In the context of an upper airway procedure requiring suction it is recommended that a telemonitor and camera should be used instead of the eyepiece on the endoscope to increase the distance between operator and patient and minimise aerosol inhalation. These utilise a barrier strategy to prevent viral transmission to the operator. Reducing escape of aerosols from the patient to surroundings might add more safety and might lessen time lag in use of clinic rooms. We describe a barrier device for patients that is easily made from available materials in hospitals with an anaesthetic or emergency department, cost effective, easy to use and well tolerated by the patient.

Technical Description

The device is composed of an anaesthetic "closed" facemask, anaesthetic filter, DAR (Covidien) connector (or similar), which is L shaped with a closable hole for instruments (alternatively a T-piece connector 22mm) and a harness attachment for continuous positive airway pressure (CPAP) (VYGON) (**Figure 1**). Local cost for all disposable pieces (all save the CPAP harness) totals £1.86. The filter and DAR/T-piece are attached to the closed facemask as seen in**Figure 1** with the filter facing inferiorly. If using a T-piece, a seal is made with "finger" of glove attached and a small hole is made with a thick needle for passing of endoscope. The mask is inverted to align the hole with the nostrils instead of the mouth and it is secured in place with the CPAP harness (**Figure 2**).

The "closed" anaesthetic masks come in many sizes. Sizes 3-4 are generally suitable for women and 5-6 for men. The correct size is best ascertained by measuring the distance between the nasal bridge and a point below the lower lip where it is fully covered by the sides of the mask. For edentulous patients, dentures are left in place. Applying a thick coat of gel lubrication to patients with facial hair can encourage a seal for these patients.

The device was tested for comfort by the authors and barrier seal was verified by manually covering the anaesthetic filter. This can be replicated with every patient to test an appropriate fit (**Figure 2**). It should be impossible for the patient to breath in when the filter is covered. Nasoendoscopy is performed as demonstrated on patients (**Figure 2**).

Full PPE as described above should still be used as well as a camera and monitor where able. Local anaesthetic on a cotton patty (not spray) should be used before attaching the mask to reduce sneeze or cough. The scope could be withdrawn whilst holding a cleaning wipe to reduce the chance of droplets failing and contaminating the air. After the procedure, remove the scope and send for cleaning as per local protocols. The mask and attachments should be discarded apart from the harness which can be reused after cleaning with appropriate wipes for 60 seconds (or as per local policy).

Discussion

This device provides a means to help to reduce viral transmission and provide ENT staff with additional protection. It likely reduces the chance of aerosol spread and contamination of the clinic room. It is simple, reproducible and easy to make with available resources in every department.

Some limitations of this paper are that the device may be uncomfortable for some patients but it was well tolerated by the authors and patients in clinic to date. Some hospitals may not have theatre/emergency departments and thus, may have require special ordering to get all kit pieces needed. These items should be on ordering lists as they are all standard pieces on emergency trolleys – apart from the CPAP harness. Further, assembly of the device and verifying the seal will mean procedures take\souts more time and may not be appropriate in some emergency settings. Lastly, humidification in a closed circuit may present an issue where demisting agents are not available – the authors suggest gently pressing the lens of the endoscope on a clear area of the inferior turbinate to clear large debris or eliminate misting.

Areas for future research would include the impact using this device has on clinic times. A pre-made supply of the most common mask sizes could be created to minimise delay in clinics. Further, would be looking into its practicality in emergency settings. Most impactful of all would be to test if the patient wearing this mask reduces or prevents aerosolization completely.

References

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Figure legend

Figure 1: Device assembly (a. mask, b. DAR, c. filter, d. T-piece, e. assembled device)

Figure 2: Patient checking seal (a) and device used during nasoendoscopy (b)