Minimizing Healthcare Worker Contamination Risk During Tracheostomy

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We read the article, "Novel approach to reduce transmission of COVID-19 during tracheostomy," by Foster and colleagues.[1] We appreciate the authors' protocol to reduce the risk of healthcare worker (HCW) infection during most of the surgical procedure; however, based on our experience with Coronavirus disease (COVID-19) pneumonia patients in one of Italy's national "hot spots" (Pesaro Civil Hospital, Marche Region), we believe the most dangerous phase for HCW contamination in tracheostomy is the interval between deflation of the endotracheal tube (EET) cuff and the patient's reconnection to the ventilator through the cuffed tracheostomy cannula (TC).

In order to minimize such risk, we propose the following tips. First, advance the EET until its hyperinflated cuff approaches the carina (to avoid cuff damage during tracheal incision) preoperatively. We avoid pushing the EET caudally right before tracheal opening (intraoperatively)[2] because this requires a cuff deflation-reinflation maneuver, enhancing the intraoperative risk for contaminated expired air to infect HCWs (anesthesiologist and anesthesiology nurse). Second, adequate preoxygenation (100% oxygen for 3 minutes) followed by interruption of mechanical ventilation 30 seconds before tracheal incision (pre-tracheotomy apnea). This step, proposed by Wei and colleagues,[2] prevents the expired air to come out under pressure ("champagne effect") from the patient's lower airways after EET cuff deflation, with a consequent reduction of HCW contamination risk. Third, a Halyard closed suction system (Halyard Health) is connected to the TC (with its nonfenestrated inner tube already inserted) before tracheal opening (Fig. 1) and is attached to the ventilator at the end of surgery. The time interval (air exposure time [AET]) between EET cuff deflation and connection of the cuffed tracheostomy cannula-Halyard system to the ventilator is the most hazardous phase for HCW contamination, because the patient's lower airways are not entirely "excluded" (not connected to the ventilator system) from the external environment.[2-6]

We quantified this contamination risk by measuring AET in 24 COVID-19 patients (19 M, 5 F), mean age 62.9 $\pm$ 11.8 years, submitted to tracheostomy between February 3 and March 25, 2020. The AET for surgical tracheostomy was 5.5 $\pm$ 1.5 seconds, less than ($p < 0.001$) the AET for percutaneous tracheotomies (21.8 $\pm$ 5.7 seconds) performed in COVID-19–negative subjects. The use of the Halyard system (connected to the cannula before tracheal opening) not only minimizes AET, but enables immediate aspiration of tracheal/bronchial infected secretions after EET removal through a "closed circuit," therefore reducing the risk of HCW contamination. As a confirmation, in our case series, no HCW infection has been recorded so far. Last, creation of the Björk tracheal flap, sutured to the overlying skin by 2 single stitches with Vicryl 2/0 (Johnson & Johnson Intl), eases TC insertion/substitution and minimizes HCW contamination risk in the recovery period.

In conclusion, we thank Foster and colleagues[1] for their protocol. We believe combining their idea with the tips we have developed, together with having an operating room inside the ICU with negative pressure, a meticulous "clean/contaminated" dressing pathway, and an experienced "COVID-19 airway team," may be useful for better surgical planning and prevention of HCW infection when performing tracheostomy in patients affected by COVID-19 pneumonia.

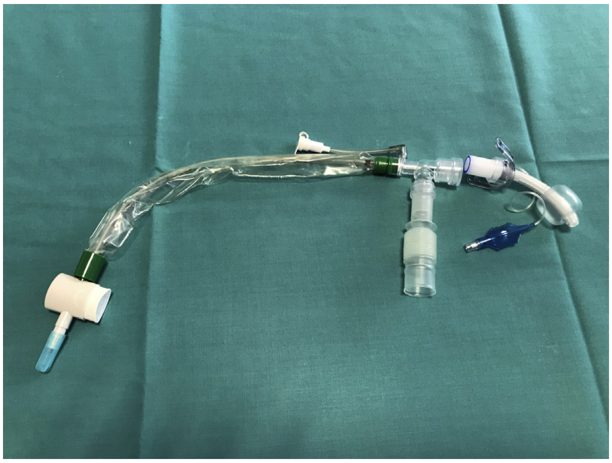

Figure 1. Halyard closed suction system (Registered Trademark or Trademark of Halyard Health, Inc. or its affiliates. Copyright 2016 HYH) is connected with the tracheostomy cannula before cannula insertion into the trachea.

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REFERENCES

1. Foster P, Cheung T, Craft P, et al. Novel approach to reduce transmission of COVID-19 during tracheostomy. J Am Coll Surg 2020 Apr 10 [Epub ahead of print].
2. Wei WI, Tuen HH, Ng RW, Lam LK. Safe tracheostomy for patients with severe acute respiratory syndrome. Laryngoscope 2003;113:1777−1779.
3. Tran K, Cimon K, Severn M, et al. Aerosol generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. PLos ONE 2012;7:e35797.
4. Harrison L, Winter S. Guidance for surgical tracheostomy and tracheostomy tube change during the Covid-19 pandemic. Available at: http://www.entuk.org/tracheostomy-guidance-during-covid-19-pandemic. Accessed May 4, 2020.
5. Canadian Society of Otolaryngology - Head and Neck Surgery. Recommendations from the CSO-HNS Taskforce on performance of tracheotomy during the COVID-19 pandemic 2020. Available at: https://www.entcanada.org/wp-content/uploads/COVID-19-Guidelines-CSOHNS-Task-Force-Mar-23-2020. Accessed April 13, 2020.
6. Kim HJ, Ko JS, Kim TY, Scientific Committee on Korean Society of Anesthesiologists. Recommendations for anesthesia in patients suspected of Coronavirus 2019-nCoV infection. Korean J Anesthesiol 2020;73:89−91.

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Postural Ergonomics and Micro-Neurosurgery: Microscope Has an Edge Over Loupes

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We read with interest the work by Yang and colleagues[1] highlighting the importance of postural ergonomics and the commonality of this occupational risk to surgeons in several specialties. Alarmingly, they showed that in procedures with loupes, there were significantly more extreme neck angles, increased awkward neck postures, and a significant impact on both subjective and objective workloads.

Although loupes do have advantages, such as portability, lower cost, and maneuverability (eg in complex spine procedures), this may be a false economy in micro-neurosurgery. We would humbly submit that microsurgery with a microscope is ergonomically more efficient than with loupes and headgear, at least in neurosurgery. A microscope enables the surgeon to maintain a neutral head-neck posture and a horizontal gaze into the microscope, whereas loupes require a flexed posture for prolonged periods of time and use the microscope optics to focus at different planes and differing depths (ie variable depth focus). This avoids micro-adjustments using one's neck to obtain better focus with loupes, allows the exact same view as the assistant; and 2 surgeons on loupes have each a different line of sight, and therefore, a different field of view. A coaxial view enables better assistance, coordination, synergy, better training, the ability to follow a resident's/fellow's actions with more confidence and efficiency, work at adjustable and much greater magnification than the fixed and smaller one with loupes (eg 30x vs 3x), and have better and adjustable illumination at depth than with headgear.

Building on ergonomics, the advanced technology of modern microscopes offers further advantages. They can capture high-definition image or video documentation of each surgical step for post-hoc educational analysis in ergonomics, robotics, skill assessment, or medico-legal purposes. They can function as intraoperative imaging tools, recognizing chromophores through dedicated optical filters (even white-light); provide fluorescence guidance for tumors, aneurysms, etc; integrate extraoperatively acquired multi-modal (image) information including diffusion tensor imaging, functional imaging, transcranial magnetic stimulation, augmented reality, etc. They may also be semi-robotically used, because these images are part of computer-assisted guidance/neuronavigation,[2] and they can be connected with intraoperative monitoring and mapping devices in order to follow the signals of electrophysiology.

Evidence for occupational risk, though elementary, comes from both engineering and qualitative studies. An asymmetrical head-neck posture was maintained in 85% of operating time with loupes and headlamps, which were found to be important biomechanical risk factors for cervical musculoskeletal disorders among microsurgeons.[3] Data are emerging showing that more than two-thirds of spine surgeons using loupes and headgear reported neck pain; and more than half had treatment for it.[4] Three-quarters of neurosurgeons experienced work-related musculoskeletal discomfort; 11% took time off work and 7% underwent operation.[5]

Postural ergonomics for surgeons merit further attention as a risk factor for cervical spine degenerative disease.