

# The ORBEYE 4K 3D to safely replace selected microsurgical and transoral robotic procedures during COVID-19 pandemic

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## Abstract

Not requested, from author guidelines: Correspondence: Technical Notes– For contributions reporting technical descriptions which do not report on measures outcomes. Such contributions must materially add to rather than repeat the existing literature. Not to exceed 1,000 words and six references. Two tables/figures maximum. Three succinct key points and no abstract.

## Background

At the end of 2019, an outbreak of a respiratory disease called “novel coronavirus disease 2019” (COVID-19) started in Wuhan (China) and has spread worldwide, reaching a pandemic proportion since 11<sup>th</sup> March. To date (24<sup>th</sup> April 2020), the responsible pathogen, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has infected 2’626’321 people all over the world, causing 181 938 confirmed deaths. The most affected countries are U.S.A., Italy and Spain, with 42’311, 25’549, and 22’157 deaths, respectively, according to W.H.O. data. The unpredictable speed of diffusion, notwithstanding a low direct mortality rate, brought to a severe intensive care units overcrowding and seriously jeopardize health-services, particularly in Italy.

Indeed, the risk of contagion is higher in the hospital environment than in the community. A supposed hospital-related transmission has been estimated to occur in more than 40% of cases.<sup>1</sup> Among healthcare workers, anesthesiologists, otorhinolaryngologists and head and neck surgeons seem to be the most prone to direct exposure.<sup>2</sup> In fact, being the SARS-CoV-2 primarily transmitted by respiratory droplets or infected secretions, the abovementioned specialists daily incur high-risk clinical maneuvers and surgical procedures, such as intubation, nasal endoscopy, flexible fiber endoscopy of the upper aerodigestive tract, and oral or oropharyngeal examination.<sup>2</sup> While patients’ face masks obviously need to be removed during these procedures, clinicians are strongly encouraged to follow personal protection guidelines, wearing all the proper personal protective equipment (PPE) such as N95, FFP3 or FFP2 masks, gown, cap, eye protections (goggles and face shields), and gloves.<sup>2</sup> In addition to this, all non-urgent elective intervention and follow-up visits should be conceivably procrastinated and the treatment of time-sensitive cases, as cancer patients, should be discussed on a case-by-case basis minimizing the risks of contamination.<sup>2</sup>

In the field of Otorhinolaryngology there are urgent microsurgical procedures, such as mastoidectomy for otologic meningitis, or not deferrable oncologic surgeries on the upper aerodigestive tract, that should reasonably be performed even if dealing with suspicious or confirmed COVID-19 patients. Nevertheless, the unmodifiable necessity of the operating microscope, or the robotic da Vinci robotic surgical system, impede a proper use of the overcited PPE, since the protective glasses or face mask hinder the surgeon’s eyes to lean directly against the microscope ocular or the da Vinci console.<sup>2</sup> In order to find a feasible alternative to the

traditional microsurgery setup, it is herein proposed a possible solution with an innovative exoscopic setting based upon a 4K 3D system of vision.

### The ORBEYE 4K 3D Orbital Camera System

Amongst the marketed exoscopic devices, the ORBEYE 4K 3D platform (Sony Olympus Medical Solutions, Tokyo, Japan; FDA approved) is characterized by one of the highest magnification powers (26X with the 55" screen) keeping a full size 4K image resolution along the whole range of available enlargements. Furthermore, the motorized supporting arm makes its movements easy and accurate and the inclusion of the Narrow Band Imaging tool, developed in the gastroenterological setting and already widely used in the upper aerodigestive tract,<sup>3</sup> permits a live intraoperative control of the margins dealing with oncologic resections. During the COVID-19 pandemic, the main advantage of such device is the possibility to avoid the removal of PPE as goggles and face shields approaching microsurgical procedures, with no decreased quality of vision or depth perception if compared with the traditional settings.

Our experience is derived by a case series of twelve successfully treated patients enrolled in September 2019: three tonsillectomies (**Figure 1A-C**), three laryngeal tumors transoral laser resections (**Figure 1D-F**), one parapharyngeal tumor transoral resection (**Figure 1G-I**), three glottic phonosurgical procedures (**Figure 1J-K**) and two free flaps harvesting with microvascular anastomosis (**Figure 1L**).

In the context of pharyngo-laryngeal oncologic transoral procedures, the ORBEYE 4K 3D guarantees a clear view especially for tumors of the tonsillar area or lateral oropharyngeal wall, with no need of angled telescopes coupled to the camera. Moreover, by means of ORBEYE 4K 3D and a Tullium-diode fiber laser as cutting device, both an excellent cutting and coagulation power are ensured, being possible to achieve very accurate resections with a minimally invasive approach.

The high magnification power with 4k resolution also allows the execution of microsurgical vascular anastomosis for free flaps reconstructions, suggesting its easy application as system of vision, as already tested also by other authors, in several microsurgical fields as otoneurosurgery,<sup>4</sup> reconstructive surgery,<sup>5</sup> ophthalmology or neurosurgery.<sup>6</sup> Furthermore, its excellent lighting and image definition features permit a clear view also in the narrow corridor of a laryngoscope, ensuring precise phonosurgical procedures, also with a better ergonomics; this suggests, in centers already equipped with this technology, a benefit also for elective transoral procedures after the end of the COVID-19 pandemic.

### Suggestions during COVID-19 pandemic

The acquisition costs of this equipment, in the context of a world economic crisis, should be taken into account; anyway, in centers where this exoscopic platform is available yet, since no procedure-related costs are ascribable except for the sterile coverage of the machine as for the operating microscope, we would recommend its adoption replacing the latter and, in selected cases, also the da Vinci Robotic system.

Delaying oncologic time-sensitive surgical procedures for impossibility of application of conventional microsurgery, and being unpredictable the duration of the COVID-19 pandemic in several countries, can have catastrophic consequences for our patients affected by malignancies. Any effort should be done providing the best health care compatible with safety of the surgeons, and in this scenario the ORBEYE 4K 3D orbital camera system is one of the promising solutions guaranteeing the correct use of all PPE needed facing suspect or SARS-CoV-2 positive patients.

### References

1. Wang D, Hu B, Hu C, et al. Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA - J Am Med Assoc*. 2020;323(11):1061-1069. doi:10.1001/jama.2020.1585
2. Day AT, Sher DJ, Lee RC, et al. Head and neck oncology during the COVID-19 pandemic: Reconsidering traditional treatment paradigms in light of new surgical and other multilevel risks. *Oral Oncol*. 2020:104684. doi:10.1016/j.oraloncology.2020.104684

3. Cosway B, Drinnan M, Paleri V. Narrow band imaging for the diagnosis of head and neck squamous cell carcinoma: A systematic review. *Head Neck* . 2016;38 Suppl 1:E2358-67. doi:10.1002/hed.24300
4. Smith S, Kozin ED, Kanumuri V V., et al. Initial Experience with 3-Dimensional Exoscope-Assisted Transmastoid and Lateral Skull Base Surgery. *Otolaryngol - Head Neck Surg (United States)* . 2019;160(2):364-367. doi:10.1177/0194599818816965
5. Grammatica A, Schreiber A, Vural A, et al. Application of a 3D 4K exoscopic system to head and neck reconstruction: a feasibility study. *Eur J Plast Surg* . 2019;42(6):611-614. doi:10.1007/s00238-019-01521-1
6. Murai Y, Sato S, Yui K, et al. Preliminary clinical microneurosurgical experience with the 4K3-dimensional microvideoscope (ORBEYE) system for microneurological surgery: Observation study. *Oper Neurosurg* . 2019;16(6):707-716. doi:10.1093/ons/opy277

## Figure Legends

**Figure 1: several tested applications of the ORBEYE 4K 3D** . Surgical setting (**A** ) and intraoperative view (**B**, **C** ) of a transoral exoscopic tonsillectomy (**A** ). Intraoperative view of a right vocal fold carcinoma seen through the narrow space of a laryngoscope with the ORBEYE 4K 3D exoscope (**D** ); full magnification surgical view with white light (**E** ), or enhanced with Narrow Band Imaging (**F** ) . Surgical setting during a transoral exoscopic resection of a left benign parapharyngeal space tumor (**G** ), the left pharyngotomy necessary to approach the parapharyngeal space by fiber Tulum-diode laser (**H** ) , and the dissection along the tumor capsule (**I** ). Intraoperative view of the glottis before (**J** ) and after (**K** ) a right vocal fold augmentation with autologous fat. End to end microvascular anastomosis performed with the ORBEYE 4K 3D assistance during the inseting of a radial forearm free flap (**L** ). All pictures were taken in September 2019, before COVID-19 pandemic.

## Conflict of Interest

*The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest .*

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## Data Availability Statement

*The original contributions presented in the study are included in the article and supplementary files, further inquiries can be directed to the corresponding author.*

