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My Thoughts / My Surgical Practice

## Personal protective equipment against COVID-19: Vital for surgeons, harmful for patients?



In the beginning of 2020, the world scientific community faced the novel coronavirus SARS-CoV-2 or COVID-19, which presented a mortality of 0.25–3% and an Intensive Care Unit (ICU) admission rate of 20%. The outburst of this RNA-virus was so huge, that in March 2020 the World Health Organization (WHO) declared a global pandemic, which led to a mandated lockdown for almost one quarter of earth's population.<sup>1</sup> The surgical community was generally affected during COVID-19 outburst, as in many countries most elective surgical procedures were postponed, due to high demand for ventilators and specialized medical staff in intensive care units (ICUs).<sup>2</sup> All surgical societies published specific criteria about high-risk surgical procedures and management of oncologic patients with alternative treatment options, such as chemotherapy or radiotherapy, after discussion by virtual Tumor Boards, that included surgeons, medical oncologists and radiologists.<sup>3</sup> Moreover, additional preventive measures against COVID-19, such as preoperative testing or patient decolonization, took place when resources were available.<sup>4</sup> (see Fig. 1)

Operating room (OR) was considered as a high-risk place for COVID-19 transmission, due to consecutive aerosol generating procedures (AGPs). Tracheal intubation, non-invasive ventilation, tracheotomy, cardiopulmonary resuscitation and manual ventilation before intubation were considered as high-risk AGPs. Moreover, due to the increased risk for COVID-19 transmission during pneumoperitoneum creation for laparoscopy, a dilemma between laparoscopy and laparotomy had to be answered even for operations that laparoscopy is strongly indicated.<sup>5</sup> Previous experience with SARS showed a potential viral load of these procedures and increased risks for viral transmission. In addition, most of RNA-viruses had been identified inside the human gastrointestinal (GI) tract in the past.<sup>6</sup> Because of the possible contact with increased COVID-19 load during open and laparoscopic GI surgery, such procedures were classified as high-risk AGPs, despite the decreased aerosol generation. Therefore, the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), followed by most GI surgical communities all over the world, suggested the following PPE during GI surgery of a confirmed or highly suspected COVID-19 patient<sup>7</sup>:

- N95 or filtering facepiece (FFP) 2 respirator masks or controlled air purifying respirators (CAPRs) for mouth and nose protection.
- Goggles or face shields for eye protection.
- Surgical gowns, caps and shoe covers for skin and clothing protection.
- Gloves for hand protection.

The previous recommendations were so strong, that a global consensus emerged after the initial statement of the Royal College of Surgeons of England: surgical procedures were forbidden where adequate PPE was unavailable.<sup>8</sup> However, the wide use of PPE by healthcare workers during COVID-19 outburst demonstrated a few side effects of prolonged PPE wearing, especially in emergency departments and ICUs. For example, in a study of 158 healthcare workers that used N95 masks and goggles, 81% developed *de novo* PPE-associated headaches. In addition, 91.3% of the healthcare workers with a primary headache in the past, reported that the prolonged (over 4 hours) use of PPE during COVID-19 outburst worsened their headaches and affected their job performance.<sup>9</sup> Moreover, another study of 43 healthcare workers, that used PPE for  $8.76 \pm 2.31$  hours per day during management of COVID-19 patients, outlined various PPE-induced dermatoses, such as pressure injury, contact dermatitis, pressure urticaria and exacerbation of pre-existing skin diseases. Irritant contact dermatitis (ICD) (39.5%) followed by friction dermatitis (25.5%) were the most common dermatoses reported. Goggles were the most common type of PPE causing dermatoses (51.9%), followed by N95 masks (30.8%). Most workers presented pruritus (67.4%) and erythema (53.5%). Unfortunately, 21% of medical staff suffered from work absenteeism due to one of the dermatoses, leading to a significant decrease in human resources during a crucial "medical battle".<sup>10</sup>

Six months after the initial shock from COVID-19 outburst, containment measures, such as lockdowns and quarantines, have been gradually quitted, while the medical community seems to be organized against this public threat. Several pharmaceutical therapeutic agents have been used against COVID-19, while all efforts have been guided towards construction of a safe and effective vaccine.<sup>11</sup> However, a lot of countries are about to face a second outburst of COVID-19. The expected socioeconomic consequences of a possible second global lockdown show that it is not a possible option.<sup>12</sup> Consequently, the number of required surgeries for COVID-19 patients would be increased in the next months. As a result, surgeons and OR staff are expected to be more exposed to PPE during surgery.

Either in the case of a second lockdown or not, the safety of PPE use against COVID-19 for surgeons should be investigated. All parts of PPE increase surgeon's body temperature and sweating, leading to an impairment of surgeon's comfort, especially during prolonged and complicated surgical procedures. As mentioned above, PPE seems to be associated with important side effects, like dermatoses and headaches for healthcare workers. The PPE-associated discomfort and side effects during surgery may increase surgeons' anxiety

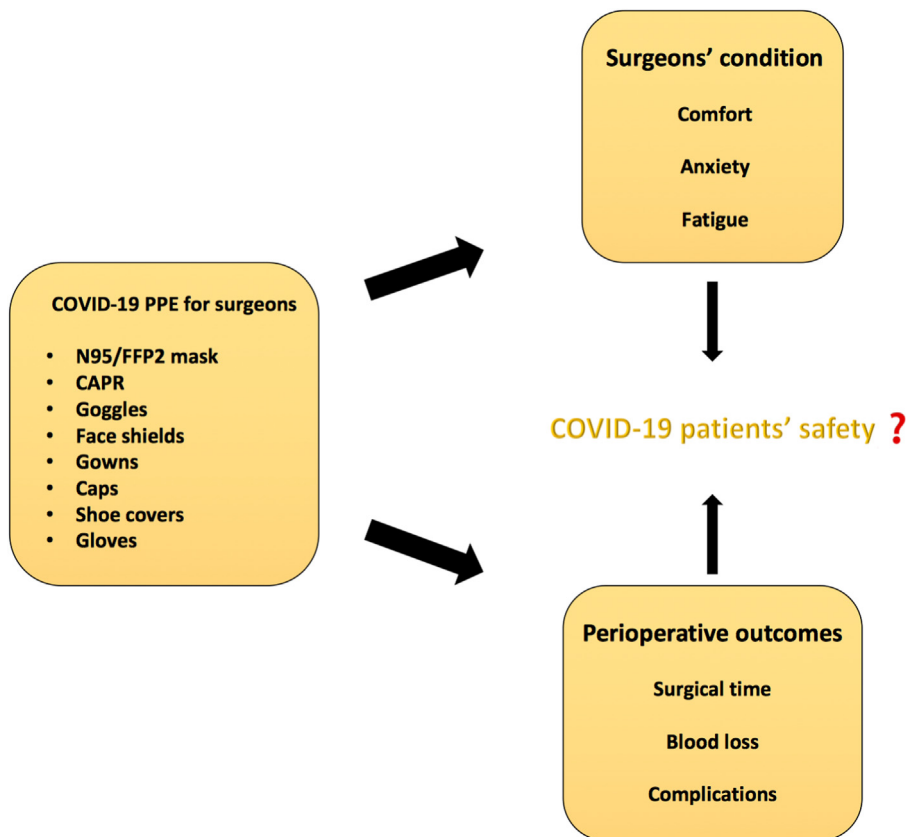


Fig. 1. The proposed investigation of intraoperative PPE's impact on surgeons' condition and perioperative outcomes.

and fatigue while performing difficult operations. Patients diagnosed with COVID-19 are frail, due to the multi-organ dysfunction that is usually caused, requiring the highest surgical performance in the operating room. Therefore, PPE's effect on surgeon's comfort and psychological status should be investigated in future studies. A comparison between surgeons wearing different quality PPE parts in terms of intraoperative comfort, anxiety and fatigue during certain operations for patients without COVID-19, is proposed. For example, the comparison between face shields and goggles or between FFP masks and CAPRs could highlight the different impact of two similar PPE parts on surgical parameters, without undermining surgeon's protection. In addition, the frequency of alternative treatments due to surgeons' reluctance to operate in PPE would be a very interesting parameter for future studies. PPE against COVID-19 during surgery may be actually life-saving for a surgeon, but is it really safe for a patient? Is there something that the surgical community could do to improve surgical conditions and patient's safety?

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