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Personal Protective Equipment for the Surgeon: operating in the presence of COVID 19, an unseen enemy

Case Report

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Abstract

COVID 19 is a serious pandemic that has affected and compromised healthcare, in particular, surgical problems. From limitation in personal protective equipment, PPE, to widespread differences of opinion regarding aggressive of spread, the surgeon and surgical team are exposed to this virus.

The objective of this case report and perspective article was to outline the safety protocols undertaken by the respective surgeons, the surgical PPE experience in the literature and our recommendations for the surgeon and surgical team.

Materials and Methods: We performed a review of the literature using PubMed, Medline, Google Scholar, Johns Hopkins University Coronavirus Resource Center and the State of Texas, USA resources. We also used our own data at our tertiary care hospital and medical center to report operative PPE and outcomes.

Results: The data for PPE in the operative setting is limited in the literature. There are isolated case reports, and broad recommendations based on theory but very little practical data. Multiple regional and national organizations have set forth protocols and guidelines; however these are more to conserve equipment and hospital beds, anticipating surges of COVID 19 cases.

Discussion & Conclusion: While limited in literature available and our small sample size, we recommend aggressive protection. Our institution surgeons performed the emergent cases using N-95 masks and face shields on top of the usual surgical room attire, however we advocate positive pressure hoods and/or protective equipment. COVID 19 proves to be the silent enemy, and we cannot underscore enough the important of prevention and safety.

Introduction

The COVID 19 pandemic created unprecedented work and healthcare process issues for hospitals and medical professionals in every facet of medicine. First reported in late 2019, in Wuhan, China, the disease has spread to all parts of the world. As of March 11, 2020, there have been 1,776,157 cases reported, with 108,804 deaths [1].

Much of the focus has been curtailed to virus presentation, tests for confirmation and containment. There does not exist a vaccine or medical treatment regimen to address the disease. Management has been centered around early identification and isolation of the affected individuals. While a great deal of attention has been focused on these important attributes, there still exist COVID patients that develop other serious ailments. From bedside procedures to major surgical operations, there has been very few studies or reports looking at the process, outcomes, protective efforts and resultant sequelae of completing such operations, on healthcare teams.

The purpose of our manuscript is to present two patients that underwent general anesthesia for indicated surgical procedures, where both patients had confirmed COVID diagnoses. We subsequently reviewed the literature for protective personal protection equipment (PPPE) to be used during an operating room setting, and made our recommendations as well based on the literature and our limited experience.

Methods: We reviewed PubMed, Medline, Google Scholar and the Johns Hopkins Coronavirus Resource Center to obtain data and information pertaining to COVID 19 and personal protective equipment, PPE. Our focus on PPE was particularly in the operating room setting. We also presented two confirmed COVID 19 cases that needed emergent operative intervention.

Cases

Patient one was a 55 year old male admitted with worsening shortness of breath and abdominal pain. The abdominal pain had started a few days prior to presentation. The shortness of breath was more acute and prompted the patient to present to the hospital emergency room. Upon undergoing diagnostic and laboratory imaging, the patient was deemed COVID 19 positive, based upon his CT Chest findings and clinical history. This was later confirmed with real time reverse transciptasepolymperase chain reaction, RT-PCR. The CT Pelvis revealed a significant 11 mm ureteral calculus. The patient was admitted to the hospital COVID unit for symptomatic and supportive care.

The abdominal pain continued to worsen, with elevations in temperature, WBC count, tachycardia, tachypnea and an overall picture or progressing sepsis. The demand for oxygen did not change.

At this point, percutaneous nephrostomy versus cystoscopy were both discussed, and it was decided that cystoscopy would be undertaken. The patient underwent a successful extraction of the stone, and improved significantly. The urologist's PPE consisted of shoe covers, an impervious surgical gown, N-95 mask, face shield, and surgical hat. The urologist was asymptomatic for greater than 14 days after completion of the procedure.

From a COVID standpoint, the patient remained hospitalized, until his oxygen saturation and demands improved and he was subsequently discharged home.

Patient 2 was a 67year old female that was admitted to the hospital with worsening shortness of breath. Her COVID 19 workup, including laboratory findings, diagnostic imaging and finally RT-PCR were all confirmatory for COVID.

While in the hospital she developed acute abdominal pain. A CT scan of the abdomen and pelvis revealed perforated viscus. The patient was taken emergently to the operating room, where she was found to have a perforated gastric ulcer. She underwent a primary surgical repair with buttressing.

The operative team PPE consisted of surgical hats, N-95 masks, eye protective goggles, face shields, impervious gowns and shoe covers. The team was instructed to change scrubs immediately following the case, with the soiled scrubs wrapped separately for cleaning and processing. The team did not suffer any sequalae from the exposure. The patient recovered from the operation, although did require 72 hours of intubation following the procedure. She was discharged home in stable condition.

Results and Discussion

PPE during COVID has been a highly contested topic. In the United States, the limited availability of N95 masks, face shields and other PPE forced multiple policies to be created.Elective cases were prohibited to save supplies and medical space for COVID patients. In other parts of the world, Italy and Spain, in particular, similar rules and laws were enacted to preserve the limited number of supplies and hospital rooms as well [2-4]. Recommendations were expanded to limit the spread of COVID, such as pushing for more laparoscopic over traditional open operations, to mitigate the direct airborne exposure [5,6]. Countries like China and Nigeria advocated for similar precautions when addressing oncologists treating active chemotherapy patients, given their susceptibility to opportunistic infections and viruses [7]. Papers from Japan described meticulous protocols and steps for intubation, advocating

limited teams performing the majority of COVID cases, thus minimizing the number of healthcare workers directly exposed [8]. Interestingly some studies even called for natural orifice extraction of abdominal specimens, which hadbeen, and continues to be, a highly controversial subject in the realm of surgery [9]. Violating a perfectly functional organ/membrane to remove diseased pathology has not been widely accepted.

At our institution, we are the primary center for receiving and treating COVID patients for the entire county. We have strictly adhered to state and local guidelines in regards to cancelling elective cases [10]. While we have allowed cancer cases to proceed, these undergo a pre-operative review by the hospital tumor board. The tumor board consists of surgeons, medical oncologists, radiation oncologists and support staff, however surgeons are instrumental in deciding the priority of operative cases. We have tried to offer alternative options, and delay cases where the outcome would not be significantly affected.

Emergency COVID patients constitute those that must undergo operations that are life or limb threatening. Both the cases described, involved pathology that was emergent. While the intubations for the case was done with a solo anesthesia provider, we further advocate for use of a positive pressure protective hood. There is evidence that the COVID 19 virus, SARS-CoV-2 has the ability to aerosolize during intubation and other procedures. Evidence has shown the positive pressure protective hoods have been protective, with follow up sputum samples negative for COVID 19 in healthcare workers that have performed oral airway procedures [11]. Sputum samples offer the greatest amount of viral load, and thus are the most sensitive medium for RT-PCR.

While office based procedures have been sufficed with PPE consisting of N-95 masks, gloves and gowns, the potential for viral exposure and aerosolization is relatively low. Intubation, operative intervention, in particular abdominal cases, have a much higher rate of infectivity and exposure, just based on lack of barriers. The literature has very few studies addressing positive pressure protective equipment as yet another safety protocol, largely because of the limitiven availability of this resource. While standard operative gowning protocol is mandatory, we have seen evidence of positive pressure protective hoods conferring greater confidence in protection. While they may be limited in number, the lack of resources should not an acceptable avenue to compromise the safety of surgeons and healthcare workers.

We appreciate the limited number of studies and data available to arrive at a definitive conclusion, however given the limited studies and incredible infectivity of this virus, we recommend adopting these protective guidelines. Healthcare workers, especially surgeons, are battling an unseen enemy, that must be approached with caution and an aggressive proactive attitude.

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