

COVID-19 AND ANAESTHESIOLOGIST: WHAT WE SHOULD KNOW

R Arun Kumar^{1*} and Ahamed Ashar Ali H²

¹ Associate Professor, Department of Anaesthesiology, PSG Institute of Medical Sciences and Research, Peelamedu, Coimbatore - 641004, Tamilnadu

²Consultant, Department of Anaesthesiology, Meenakshi Mission Hospital and Research Centre, Madurai - 625107, Tamilnadu

ARTICLE INFO

Article History:

Received 6th July, 2020

Received in revised form 15th

August, 2020

Accepted 12th September, 2020

Published online 28th October, 2020

Key words:

COVID-19, pandemic, donning, doffing, respiratory distress syndrome.

ABSTRACT

SARS-CoV-2 is the seventh corona virus known to infect humans and was declared a global pandemic by WHO on 11th March 2020 and national emergency set on 12th March 2020. COVID-19 is a ss RNA virus with a source possibly from zoonotic infections like bats or pangolins transmitting to humans, where when a person suffering from this disease sneezes or coughs, a lot of droplets spread in the air or fall on the ground and nearby surfaces. Personal protection is the priority to prevent the transmission of the disease. All patients entering the preoperative assessment room should be considered as covid suspected or positive cases and anaesthesiologists should wear mask at all time. Review and practice donning and doffing. Maintaining social distancing, good hygiene, hand sanitization, avoiding or restricting any travel plans and public gathering can contribute greatly in the instance of breaking the chain of active transmission.

Copyright©2020 R Arun Kumar and Ahamed Ashar Ali H. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Corona viruses are a group of related viruses that cause diseases in mammals and birds. In humans, coronaviruses cause respiratory tract infections that can range from mild to lethal. Mild illnesses include some cases of common cold by rhinoviruses, while more lethal varieties can cause severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), MERS and COVID-19. China notifies WHO on 31st December 2019; and first case reported in US was at Seattle on 15th January 2020. SARS-CoV-2 is the seventh corona virus known to infect humans and was declared a global pandemic by WHO on 11th March 2020 and national emergency set on 12th March 2020.¹

Biology and Epidemiology

COVID-19 is a ss RNA virus with a source possibly from zoonotic infections like bats or pangolins transmitting to humans, where when a person suffering from this disease sneezes or coughs, a lot of droplets spread in the air or fall on the ground and nearby surfaces. Viral S spike binds to ACE2 on type 2 pneumocytes. If another person is nearby and inhales the droplets or touches these surfaces and then touches his face, eyes or mouth, he can get the infection. The chances are more if one is within a distance of less than one meter from the

infected person. Faeco oral route of transmission has also been reported in a few cases.

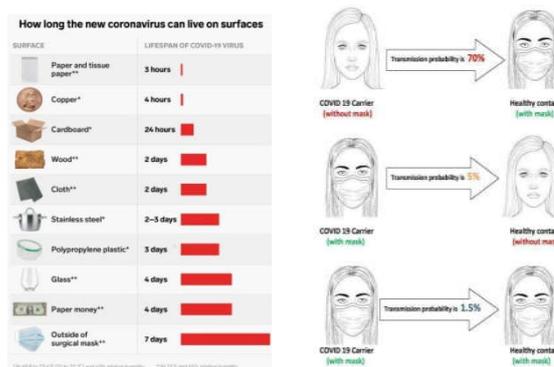


Figure 1 Depicting the life and mode of transmission of corona virus

This disease is known to occur in all age groups with more prevalence in geriatrics and persons with pre-existing chronic lung or heart diseases with an attack rate of 30 to 40% similar to influenza virus. The incubation period is 4 to 14 days typically and can extend up to 24 days. Majority of the people about 80% who acquired this disease will require no treatment and will recover on their own and a small proportion <20%

*Corresponding author: R Arun Kumar

Associate Professor, Department of Anaesthesiology, PSG Institute of Medical Sciences and Research, Coimbatore - 641004, Tamilnadu

may need hospitalization and a very small proportion mainly with underlying chronic illness may need treatment in the intensive care requiring non invasive or invasive ventilation. Case fatality rate is about 0.25 to 3 %.²

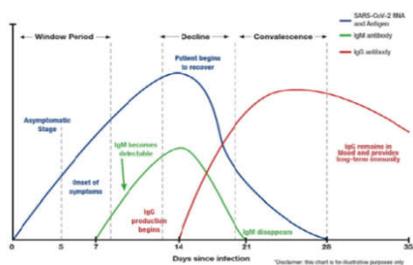


Figure 2 Variation levels of SARS-CoV-2 RNA and Antigen, IgM and IgG after infection

It is not certain how long the virus that causes COVID-19 survives on surfaces, but it seems to behave like other corona viruses. Studies suggest that corona viruses may persist on surfaces for a few hours or up to several days. This may vary under different conditions like the type of surface with which the virus was in contact, temperature or humidity of the environment.

Clinical Presentation and Diagnosis

The commonest symptoms are persistent dry cough in 65 to 80% of patients, fever in about 40 to 80 %, difficulty in breathing in 20 to 40%, upper respiratory tract infections in 15%, 10% with gastrointestinal features, joint pain and fatiguability. A positive history of close contact with the person infected with corona virus and travel history to a corona virus affected areas carries high suspicion of being infected with COVID-19. The presence of blood clots in young adults under age 50 years who have tested positive for COVID-19 can cause serious problems such as heart attacks and stroke and hence low doses of blood thinners are used to prevent clots.

Incubation	Prodromal	Pneumonia	Immunological
<p>Asymptomatic</p> <p>Most patient will be in this stage and do not progress into pneumonia phase</p> <p>3-14 days (median 5 days)</p> <p>Central fevers, malaise, anorexia</p>	<p>Symptomatic but no evidence of pneumonia</p> <p>Low grade fever, cough, sore throat, myalgia, GI disturbances, vomiting, abdominal pain</p> <p>Nasopharyngeal replication</p> <p>Day 1 - Day 7</p> <p>Observation</p> <p>Hydroxychloroquine OR Chloroquine</p>	<p>Pneumonia with hypoxia</p> <p>Clinical deterioration</p> <p>Day 8 - Day 10</p> <p>Hydroxychloroquine OR Lopinavir/Ritonavir OR Remdesivir</p> <p>Observation</p>	<p>Most mortality in this phase</p> <p>Cytokine storm (interleukin-1, TNF)</p> <p>Shock, ARDS, Multi-organ failure</p> <p>Day 10 - Day 20</p> <p>Hydroxychloroquine OR Lopinavir/Ritonavir OR Remdesivir</p> <p>Observation</p>

Figure 3 Clinical progression and proposed management³

The complications include shock, acute respiratory distress syndrome, arrhythmia and acute renal injury. The first is real time reverse-transcriptase polymerase chain reaction (rRT-PCR) of nasal swab and sputum. Currently rapid RT PCR test requires 2-4 hours turnover which indicates active infection. Interpreting the result of a test for covid-19 depends on two things: the accuracy of the test, and the pre-test probability or estimated risk of disease before testing. A positive RT-PCR test for covid-19 test has more weight than a negative test because of the test's high specificity but moderate sensitivity⁴.

Table 1 Corona testing positivity rates – Journal of American Medical Association (JAMA)⁵

S.No	Type of specimen	Positive (%)
1	Bronchoalveolar lavage fluid	93
2	Fibrobronchoscope brush biopsy	46
3	Sputum	72
4	Nasal swabs	63
5	Pharyngeal swabs	32
6	Faeces	29
7	Blood	1
8	Urine	0

A single negative covid-19 test should not be used as a rule-out in patients with strongly suggestive symptoms.

Roughly

- First swab negative means – 50% chance of being positive
- Second swab after 7 days negative means 25 % chance of being positive

14th day swab negative means no chance of infection

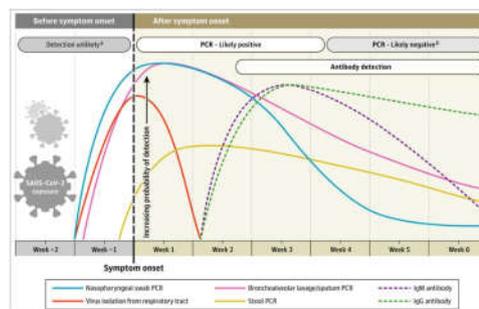


Figure 4 Delineates the Antibody detection by PCR test

Laboratory Investigations

Blood report shows leucopenia and lymphopenia, elevated liver and renal parameters, interleukins -1, ferritin, d-dimer and decreased procalcitonin. Chest x ray showed hazy, bilateral peripheral opacities and CT scan revealed ground glass opacities with consolidation changes. POCUS showed numerous B lines, pleural line thickening, consolidation with air bronchogram.⁶ CO-RADS is a categorical assessment scheme used for reporting of chest CT patients suspected of COVID19; which represents the suspicion for pulmonary involvement. Score calculation is done based on each lobe involvement (Each lobe in the lung has maximum of score 5). CT severity of COVID 19 is suspected as mild, moderate or severe when the score rate was <8, 9-15 and >15 respectively considering the summation of lobe involvement.

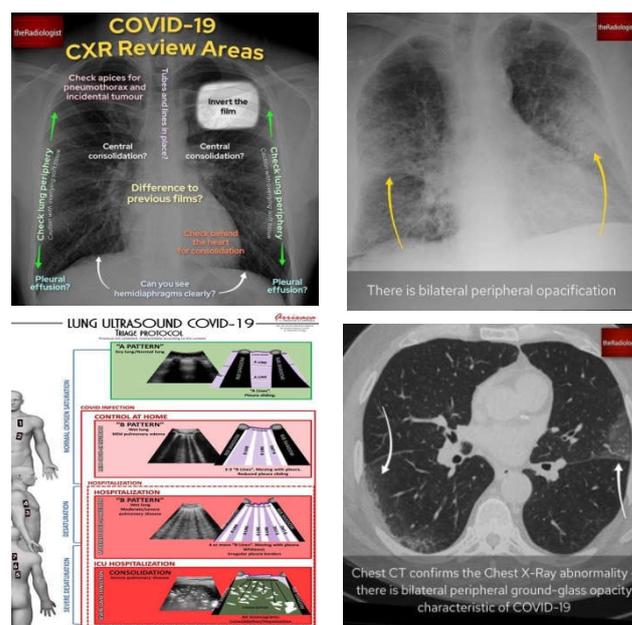


Figure 5 Chest X ray, lung ultrasound and CT scan showing diagnostic features of COVID-19

Management

Precautions

There is no definite treatment for the diseases and it consists of only conservative symptomatic treatment. The disease is self limiting illness; since it is a viral infection the person gets recovered from the illness on its own and a very debilitating individuals seek critical care management. Hand sanitizers are to be used when you are caring for patients infected with coronavirus. There are two methods of hand washing. In general, washing hands frequently with soap and water for 20 to 30 seconds is the recommended option or using alcohol based hand sanitizer for 30 seconds. If hands are dirty or soiled then do not use alcohol based sanitizer, but wash hands preferably with soap and water for atleast one minute. There is no definite vaccine available for the treatment. Maintaining good hygiene, avoid or restricting any travel plans and public gathering, social distancing can contribute greatly in the instance of breaking the chain of active transmission.⁷

Treatment

The treatment modalities consists of early isolation and to send PCR test to confirm the disease. Triage should be sorted immediately; sending an intimation to DOH and CDC.

Table 2: Drug modality – Currently recommended / suggested treatment⁸

Drug Name	Category	Status in India	Mechanism of action	When should it be used / Mode of delivery
Remdesivir	Antiviral	Approved	Speeds recovery by shutting down viral replication in the body.	For severely ill patients with worsening of imaging studies and cytokine storm. Intravenous and Inhaler (Under Trial)
Glucocorticoids	Corticosteroid	Approved	Calms acute inflammatory response to slow disease progression by preventing the body from pumping out inflammatory chemicals	For severely ill patients with progressive deterioration of oxygenation indicators, rapid worsening of imaging and cytokine storm. Intravenous
Favipiravir	Antiviral	Approved	Selectively inhibits RNA polymerase needed for the replication of SARS-CoV-2 inside the human body to cause severe disease	For mild to moderate disease. Oral tablets
Dexamethasone	Corticosteroid	Not approved	Modulates immune mediated lung injury and slow progression to respiratory failure and death. It cut the risk of death by a third for patients on ventilator	Given to severely ill patients on invasive ventilation or oxygenation. It does not help with mild or moderate disease. Intravenous route in ICU and as tablets for less seriously ill patients
Tocilizumab	Monoclonal antibody	Approved	Calms the aberrant hyper immune response, cytokine storm by acting against inflammatory chemicals to fight infection	Moderate to severe disease. Intravenous
Hydroxy Chloroquine	Antimalarial	Approved	Found to inhibit the activity of SARS-CoV-2 in lab studies by decreasing the acidity in endosomes	Prophylaxis for high risk close contacts, health care workers and frontline workers who have had unprotected exposure to infection; people with mild disease at the start of infection. Oral tablets
Convalescent Plasma	Plasma therapy	Approved for restricted use	Infection fighting antibodies from the blood of recovered people given to all patients to boost their immunity	For patients with moderate disease whose oxygen requirements is progressively increasing despite the use of steroids. Transfusion

The vaccine called ChAdOx1 nCoV-19 is being developed at unprecedented speed. It is made from a genetically engineered virus that causes the common cold in chimpanzees. It has been heavily modified first, so that it cannot cause infections in human beings and scientists did this by transferring the genetic instructions for the corona viruses ‘spike protein’ – the

crucial tool it uses to invade our cells – to the vaccine they were developing is all under clinical trial.

Peri operative preparation of suspected COVID patients

List of anaesthetic and surgical aerosol generating procedures⁹

Anaesthetic procedures

1. Awake fibre optic intubation
2. Mask ventilation
3. Intubation and extubation
4. High flow nasal cannula
5. Non invasive ventilation
6. Sputum suctioning
7. Cardio pulmonary resuscitation

Surgical procedures

1. Rigid bronchoscopy
2. Tracheostomy
3. Surgery involving high speed drilling –
4. Dental and orthopaedic procedures

Preoperative assessment clinic

- ❖ All patients entering the pre operative assessment room should be considered as covid suspected or positive cases and anaesthesiologists should wear mask at all time

- ❖ Wash the hands frequently with alcohol based sanitizer or soap and water
- ❖ Avoid crowding of patient and patient attenders in the preoperative room
- ❖ All patients to be shifted with triple layer mask
- ❖ Preoperative assessment for H/o dry cough, breathlessness, fever, myalgia ruled out
- ❖ Enquiry about travel and contact history

Check for room air saturation and temperature in preoperative room



Figure 6 PPE kit¹⁰

Preparation in the ward

- Preoperative scrub with chlorhexidine scrub from neck to toe
- Oral chlorhexidine mouth wash prior to shifting
- Leggings / head cap for patients
- Put a clamp on endotracheal tube while shifting ventilated patients to OR
- Mask not to be removed even while performing regional blockade

Prerequisites in the preoperative room¹¹

- Minimal staffs inside the operating room
- Minimal instrument handling
- Allow only 2 or 3 person during intubation
- Transparent plastic sheets over anesthesia equipments, ventilators and cautery
- PPE kit to required staffs alone
- Donning and doffing strictly inside OR
- To use smoke evacuator during surgery and CO₂ filter during laparoscopy
- Use suction device to remove gas

Time interval between start of next case should be atleast 30 to 45 minutes



Figure7 Representing Personal Protection Equipment - Donning & Doffing method

{*Before donning – Remove all external wearing such as watches, jewellery, ear rings, bangles, pen ID card etc....

**Mask should be removed only outside patient room}

Best practice recommendatations (SOPs) for airway management in patient with suspected corona viruses^{12,13,14,15,16,17}.

Before induction

- Anesthesia workstation should be covered with transparent plastic drape
- Personal protection is the priority; Prior to intubation, review and practice donning and doffing
- Experienced anaesthesiologist to perform intubation and to stop positive pressure ventilation
- Identify negative pressure environment
- Consider adopting double glove technique

During induction

- Avoid awake fibre optic intubation. Atomized local anaesthetic will aerosolize the virus and hence to consider glidescope or other videolaryngoscopes
- Plan for rapid sequence induction (RSI) and ensure skilled assistant able to perform cricoid pressure
- RSI's may be modified if patient has a very high alveolar arterial gradient and is unable to tolerate 30 seconds of apnoea
- If manual ventilation is anticipated, small tidal volumes should be applied

Five minutes of preoxygenation with 100 % oxygen and RSI in order to avoid manual ventilation of patients lungs and potential aerosolization of virus from the airways

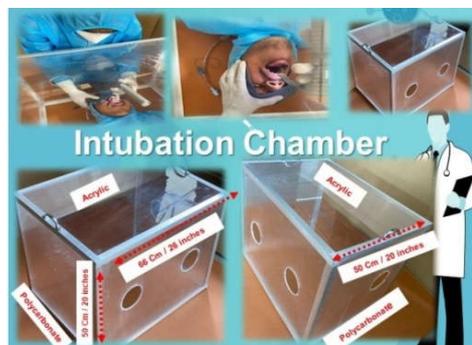


Figure 8 Intubation chamber

- Ensure high efficiency hydrophobic filter interposed between face mask and breathing circuit or between facemask and laerdal bag; avoid contamination of gas monitor
- Intubate and confirm tube position by chest auscultation and quantitative waveform capnography attaching the ETCO₂ to HMEF at side opposite to the patient
- Clamp endotracheal tube until it is connected to the circuit and do not ventilate without inflating the endotracheal tube cuff
- All airway equipment must be sealed in double zip locked plastic bag and removed for decontamination and disinfection

- Beneficial alternative intubation with second generation supraglottic airway devices in case of failed intubation
- Consider early cricothyroidectomy during cannot ventilate cannot intubate scenarios

Maintenance of anesthesia

- Minimise tube and circuit disconnection
- Keep the ventilator in a standby mode and initiate mechanical ventilation only after the circuit has been closed or reconnected
- Administer lung protective mechanical ventilation strategy
- Closed airway suction system preferable
- Limit the ventilator disconnections
- Use of anti emetics

Emergence and post extubation

- Administer antiemetics during surgery to avoid post operative vomiting
- Suppress cough reflex by intravenous dexamethasone or lignocaine before extubation
- Long transparent sheet may be placed over the patient before extubation and extubation is done from below the transparent sheet
- Complete suction of trachea and throat with meticulous precautions
- Create central hole through which mask used
- Use low flow oxygen less than 5 L/min
- Supraglottic airway device may be considered as an interim step before direct extubation
- OT personnel to get into the OT to clear instruments and clean OT only after wash out time
- After removing PPE, avoid touching ones own hair or face before washing hands

Surgical procedures involving Regional anesthesia¹⁸

There is no clear evidence stating that the administration of regional anesthesia poses risk of seedling infections to the central nervous system. Although the infections are plausible, weighing the risk benefit ratio, regional anesthesia seems to be safer compared to general anaesthesia

- Surgical masks to be worn by the patient at all times inside operating room
- Strict adherence to PPE
- Use of pencil point needles for spinal anesthesia to decrease tissue coring
- Use of a long transparent sheet to cover the ultrasound probe, cables and non essential part of the ultrasound can be covered with drape sheets to minimize contamination
- Full length transparent sheets to cover the patients while using ultrasound for establishing regional blocks or while performing POCUS
- Prefer oxygen mask over nasal prong when there is need of oxygen supplementation during regional anesthesia
- The surgical mask can be placed over the oxygen mask to minimize and limit the dispersion of airborne droplets

- Rule out thrombocytopenia before administering neuraxial blockade
- Prefer blocks that are less likely to impair respiratory function like superior truncal blocks, infraclavicular or axillary blocks
- Cautious and judicious use of sedatives
- The decision to insert and maintain perineural catheters need to be evaluated on a case to case basis

Provision of OT complexes¹⁹

- Dedicated operation theatre to perform surgery for suspected or confirmed covid cases named as COVID-OT in the COVID block adjacent to COVID ICU or High dependency unit
- Ideally two OT's - one for obstetrics and the other for general and orthopaedic surgeries
- Provision of Bio medical waste management system
- Positive pressure system and central air conditioning must be turned off
- OT should be converted into non recirculatory system by blocking off the return air vents
- Treatment of exhaust air can be done by high efficiency particulate air (HEPA) filtration
- Use disposable equipments as much as possible to avoid contamination
- Corrugated tubing to be applied to the scavenging port and that can be dipped in a bucket with 1% sodium hypochlorite solution

CONCLUSION

To summarise the management of known or suspected COVID 19 patients in the perioperative period, the anaesthesiologist, medical and paramedical personnel working in the operating room requires meticulous attention and special considerations to understand the recent concepts; and should be familiar with updates for smooth functioning in the operating suite. Newer techniques, goals and protocols, needs to be highlighted and discussed; with special attention towards debriefing to improve the skill and performance.

Source of Support : None declared

Conflict of Interest : None declared

References

1. Centers for Disease Control and Prevention. Severe outcomes among patients with coronavirus disease 2019 (COVID-19)—United States, February 12–March 16, 2020. *MMWR Morb Mortal Wkly Rep.* 2020;69:343–346. doi: 10.15585/mmwr.mm6912e2
2. Guan W-j, Ni Z-y, Hu Y, Liang W-h, Ou C-q, He J-x, Liu L, Shan H, Lei C-l, Hui DSC, et al. Clinical characteristics of coronavirus disease 2019 in China. *N Engl J Med.* 2020;382:1708–1720. doi:10.1056/NEJMoa2002032
3. Centers for Disease Control and Prevention. Information for clinicians on therapeutic options for COVID-19 patients. April 7, 2020. <https://www.cdc.gov/coronavirus/2019ncov/hcp/therapeutic-options.html/>. Accessed April 8, 2020.
4. Zhao J et al. Antibody responses to SARS-CoV-2 in patients of novel coronavirus disease 2019. *Clin Infect Dis* 2020 Mar 28-29

5. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72314 cases from the Chinese Center for Disease Control and Prevention. *JAMA*. 2020;323:1239–1242. doi:10.1001/jama.2020.2648.
6. Interpreting a covid-19 test result. *BMJ* 2020;369:m1808. <https://doi.org/10.1136/bmj.m1808>
7. COVID-19 and Anesthesia FAQ. <https://www.apsf.org/covid-19-and-anesthesia-faq/>
8. Tran K, Cimon K, Severn M, Pessoa-Silva CL, Conly J. Aerosol-generating procedures and risk of transmission of acute respiratory infections to healthcare workers: a systematic review. *PLoS ONE* 2012; 7: e35797.
9. Greenland JR, Michelow MD, Wang L, London M. COVID-19 Infection: Implications for Perioperative and Critical Care Physicians. *Anesthesiology*. 2020;Mar 19.
10. Use Personal Protective Equipment (PPE) When Caring for Patients with Confirmed or Suspected COVID-19. https://www.cdc.gov/coronavirus/2019-ncov/downloads/A_FS_HCP_COVID19_PPE_11x17.pdf
11. Wenling Wang, Yanli Xu, Ruqin Gao, Roujian Lu, Kai Han, Guizhen Wu, Wenjie Tan. *JAMA*. 2020 Mar 11 : e203786. Published online 2020 Mar
12. Kamming D, Gardam M, Chung F (2003) Anesthesia and SARS, *Br J Anaesth* 90(6):715-18
13. Caputo KM, Byrick R, Chapman MG, Orser BJ, Orser BA (2006) intubation of SARS patients: infection and perspectives of healthcare workers. *Can J Anaesth*, 53(2):122-9
14. Huang C et al., (2020) Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China
15. The ASA and APSF Joint Statement on Perioperative Testing for the COVID-19 Virus. <https://www.asahq.org/about-asa/newsroom/news-releases/2020/04/asa-and-apsf-joint-statement-on-perioperative-testing-for-the-covid-19-virus>
16. Safe Airway Society guideline for the airway management of patients with COVID-19. <https://vimeo.com/405972785/1267be1ded>
17. Malhotra N, Joshi M, Datta R, Bajwa SJS, Mehdiratta L. Indian Society of Anaesthesiologists (ISA National) Advisory and Position Statement regarding COVID-19. *Indian J Anaesth*. 2020;64(4):259-263. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7189907/>
18. Practice recommendations on neuraxial anesthesia and peripheral blocks during the COVID-19 pandemic, Uppal V, Sondekoppam RV, Lobo CA, Kolli S, Kalagara HKP. www.asra.com/covid-19/raguidance
19. Edelson et al. Interim Guidance for Life Support for COVID-19 Circulation. June 23/30, 2020;141:e933-e943. DOI: 10.1161/CIRCULATION.AHA.120.047463

How to cite this article:

R Arun Kumar and Ahamed Ashar Ali H (2020) 'Covid-19 and Anaesthesiologist : What We Should Know', *International Journal of Current Advanced Research*, 09(10), pp. 23197-23202. DOI: <http://dx.doi.org/10.24327/ijcar.2020.23202.4595>
