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Oral and Maxillofacial Surgery in Covid-19 Era: A Review Article

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Abstract:- Covid-19 pandemic- A deadly pandemic that has affected the whole world. It is caused by corona virus which is enveloped, helical in symmetry ,with positive single stranded RNA genome of size 26-32 kb. Its impact in dentistry is huge because of aerosols that contains pathogenic micro organisms which are potentially a health hazard for dental team. The purpose of this article is to protect the patients and dental staff from infection so that we can keep the healthcare system running effectively. In order to address the COVID-19 challenge, changes in the infrastructure of outpatient, inpatient units and operating rooms are necessary. Thus this article describes about the new advancements like continuous negative pressure field barrier to provide an additional layer of protection during oral and maxillofacial surgical procedures.
Keywords- aerosols, covid, infrastructure, surgery.

I. INTRODUCTION

A reservoir of high concentrations of COVID is found to be in salivary and mucosal secretions of both symptomatic and asymptomatic patients [1][2].Thus, it is significant to consider measures like Surveillance of patients and Health Care Professionals for COVID-19 (screening, testing, COVID-19 status reporting), HCP training, infection prevention and control policies ,PPE courses for staff, including donning and doffing ,Proper use of disinfectants and disinfection ,Managing essential supplies: drugs and PPE inventory, Patient care Telemedicine triage protocols for emergencies and/or clinic visits ,Prioritizing surgical care, phased timetables for ambulatory and inpatient surgeries, for safe and healthy practice because fatality rate was increasing before the introduction of vaccines across the world. Thus, the aim of this article is to plan to return to normal practice in this COVID era by engaging ourselves in awareness and new protocols by creating standard operating procedures manual or blueprint for surgery that will help us to succeed in future and keep all personnel cognizant of the policies developed. [3]

II. EVOLUTION OF COVID -19

Numerous investigations have made to determine the origins of SARS-CoV-2 ,but none has been conclusive. In November 2019, Wuhan, China it first appeared on a small scale ,with the large cluster .At the outbreak of 2002–2003, animal markets had been implicated in the SARS-CoV and initial 2019-nCoV infections are also related to the seafood market with wildlife trading[4], it was soon assumed that wild animals were also involved in the emergence of 2019-nCoV. Early investigations suggested that it would have jumped from bats to human[5]. Previous reports showed that species from the bat genera *Rhinolophus* in southern China are a rich pool of SARS-like-CoV, which belong to the subgenera *Sarbecovirus*. These viruses exhibit rich genetic diversity and frequent recombination events, which may increase the potential for cross-species transmission[6] . Consequentially, more sequence data are needed to confirm the specific source and origin of the 2019-nCoV, which can only be achieved by enhanced collection and monitoring.

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III. OSHA GUIDANCE ON PREPARING THE WORKPLACE FOR COVID -19 [7]

Generally all patients should be considered as potential carries of COVID19 .so the Occupational Safety and Health Act (OSHA) posted a new report called "*Guidance on Preparing Workplaces forCOVID-19''.Safety measures like the engineering controls, administrative controls, and safe work practice are indispensable.*

A. Engineering controls for SARS-CoV-2 include:

- Specialized negative pressure ventilation in some settings, such as for aerosol generating procedures (e.g., airborne infection isolation rooms in healthcare settings and specialized autopsy suites in mortuary settings).
- Installing a drive-through window for customer service.
- High-efficiency air filters, physical barriers, such as clear plastic sneeze guards should be installed
- Increasing ventilation rates in the work environment.

B. Administrative Controls

- face-to-face meetings with virtual communications and telework should be implemented, to control direct contact among workers
- alternating days or extra shifts among staff could maintain distance among others thereby maintaining the full onsite work week
- workers should be trained well in COVID-19 risk factors and protective behaviors (e.g., cough etiquette and care of PPE).

C. Safe Work Practices

- A work environment with plenty of resources that maintains personal hygiene should be established. For example, provide tissues, no-touch trash cans, hand soap, alcohol-based hand rubs containing at least 60 percent alcohol, disinfectants, and disposable towels for workers to clean their work surfaces.
- Regular hand washing or using of alcohol-based hand rubs should be implemented. Workers should always wash hands when they are visibly soiled and after removing any PPE.

IV. DENTAL EMERGENCY [8]

Dentists should always use their professional judgment in determining a patient's need for urgent or emergency care. The below figure shows what is dental emergency and urgent dental care[.Fig-1]

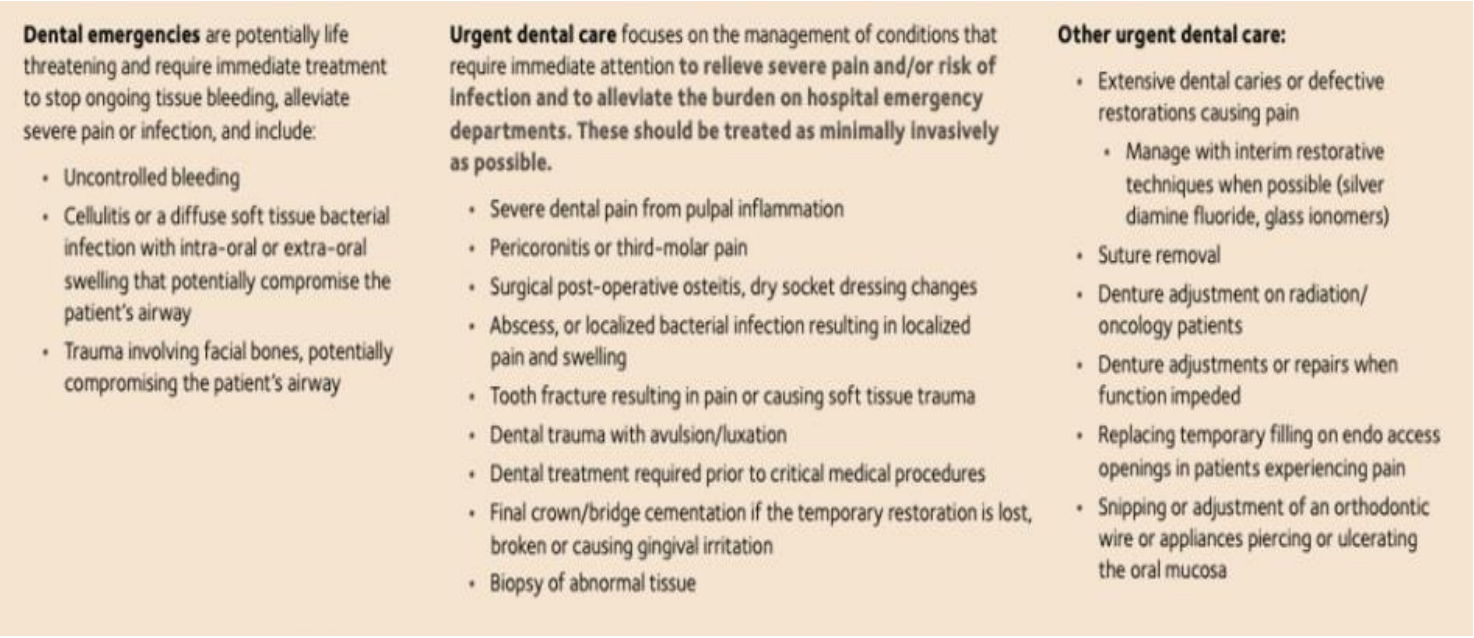

Fig -1 courtesy[8]

V. AEROSOLS – A RISK TO DENTAL SURGEONS

An aerosol is described as a suspension of liquid or solid in air [9]. When an aerosol is created with a liquid, a wide range of droplet sizes are build. Aerosols contains of droplet nuclei ≤ 5 μm in diameter and can remain suspended in air for many hours and be moved by air currents. Currently, dental procedures are categorised dichotomously as either aerosol producing or non-aerosol producing. The former refers to procedures considered to generate smaller droplets of ≤ 5 μm and the latter referring to procedures that are considered to generate few or no smaller droplets but may still produce larger droplets (> 5 μm). For the purposes of this review, aerosol will be mentioned as suspensions of particles ≤ 5 μm in diameter.

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Oral surgery is executed a variety of hand tools including high-speed dental turbines, micro-motor hand pieces, ultrasonic scalers and air–water syringes. These generate a large amount of particles and splattering and may contain microorganisms from the oral cavity of patients. It has been indicated that these aerosols contain bacteria and fungi, which may be a risk factor for cross-infection for dental professionals. Bioaerosol compositions are heterogeneous and they contain blood, microorganisms, mucosal cells, restorative materials, tooth particles and huge quantities of saliva. Pathogenic microorganisms and microbes from patients' airways may contaminate surfaces nearby and lead to a risk of infectious agent transmission-associated diseases such as influenza, tuberculosis, meningitis or severe acute respiratory syndromes ,acute viral hepatitis.[10,15]

During dental surgical procedures including endotracheal intubation, bronchoscopy, open suctioning, administration of nebulized treatment, manual ventilation before intubation, ,noninvasive positive-pressure ventilation, tracheostomy, and cardiopulmonary ,and third molar extraction with the use of unit handpieces, there is a multiple increase in concentration levels of bacteria in air during work and immediately after it has been .The microflora of air in a dental surgery contains Staphylococcus epidermidis – 37.1% of total bacteria, Micrococcus spp. – 32.6%, nondiphterial corynebacteria – 28.2%, Staphylococcus aureus – 0.6%, Pseudomonas spp.– 0.6%, and fungi – 0.9%. The presence of opportunistic microorganims (Staphylococcus epidermidis, non-diphterial corynebacteria, Pseudomonas spp.) is significant [12]. Osorio et al. [13] showed the prevalence of Streptococcus and Staphylococcus bacteria in the air of a dental surgery. Other studies indicate that 85-90% of these bacteria are Streptococcus bacteria typical for the oral cavity [14]. Researchers studying the microbiological condition of air in dental surgeries believe that this is one of the most dangerous contamination carriers in the working environment of a dentist .[11]

Proposed solutions to prevent personnel contamination. All these equipment and procedures should be used in association for all patients to try to reduce the contamination risks. [19]

1 Use of N95 (FFP2/3) respirators for all patients and all PPE such as gloves, glasses, gown etc.;
2.Individual waterproof sprayhood as protective hat (helmets with cover) with a solid sealing transparent area for all dental staff, as special PPE to use face-to-face with the patient may help to prevent spray droplet contact with neck, eyes, face; or alternatively:-Full facepiece Powered Air Purifying Respirators (PARPs) with blowers to create positive pressure inside the face piece for example in emergency with Covid-19 positive patients;
3Tyvek suit full body protection; a mono-use gown may be applied on Tyvek suits. Alternatively use of impervious disposable gown with head cap;
4Waterproof protection for shoes and for trousers to avoid the collection of wet and dry contaminated droplets from office floor that must be used with gowns and other devices.

The main strategy that we recommend is the instant removal of the spray produced]by hand-pieces and ultrasounds from the mouth-nose area, namely from the patient face and from the rubber dam surface (when present). Another new comprise double rubber-dam arch with a sliding suction pipe able to uptake spray produced in the mouth and by the nose. The recently introduced water saliva aerosol defender (WS Aerosol Defender, Cefla Medical Equipment, Modena, Italy), noticeably reduced aerosol diffusion, according to the manufacturer declaration. A new commercial sliding suction pipewith a special configuration to be positioned just around the mouth in the more convenient position. The device can be applied with or without the rubber dam and used in all oral procedures (i.e., surgery, extractions, hygiene procedures etc.).[16,19]


Fig 2, 3 courtesy- [16]

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VI. CONTINUOUS NEGATIVE PRESSURE OPERATIVE FIELD BARRIER[17,18]

A simulation of the continuous negative pressure environment was designed and developed in order to validate the concept and proof that continuous negative pressure would clear aerosolized particles from the surgical field .First the patient should be nasally intubated, followed by a standard preparation and drape of the surgical field. A Bookwalter retractor table post should be mounted to the side of the operating room bed. The oval ring was placed over the operative site, fixing it to the table using the extension bar and adjusted for the convenience of the surgical team. Self-adhesive sterile drapes (3M Steri-drapes, commonly known as 1000 drapes) should be placed circumferentially around the oval ring in order to create a drop-like curtain from the edge of the ring down to the surgical field .A transparent sterile plastic sheet, serving as an operative field barrier for droplets and debris, was draped over and secured to the oval ring with the help of non-penetrating towel clamps. In order to create a continuous negative pressure environment under the operative field barrier, a commercially available surgical waste manager with a filtered smoke evacuator was used (Neptune 3®, Stryker Corporation, Kalamazoo, MI). A 7/8-inch tubing attached to the flex bar with the tip facing the surgical field was connected to the 7/8-inch smoke evacuator port.

Fig 4 courtesy - [17]

Fig 5 courtesy- [17]

VII. CONCLUSION

The surgeons were able to safely and successfully execute the intraoral procedure while operating under a continuous negative pressure environment. Negative pressure operative fields, can be designed easily using low-cost equipment readily available in most hospitals. They may remarkably reduce the risk of exposure and cross contamination of SARS-CoV-2 in high-risk aerosol-generating procedures in and outside the OR environment. It is important to consider that the transparent plastic sheet used in this barrier system should not be tucked in, or else the force generated by the suction device causes the setup to collapse. By keeping the transparent plastic sheet loosely draped over the operative areas allows for ambient air to be constantly sucked in without causing any movement of the barrier creating the negative pressure environment. And although we usea very specific type of suction device that is highly reliable and often available in our ORs, it may be possible to achieve the similar effect with other types of continuous suction. [17]

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