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An update on SARS-CoV-2 and dentistry

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Abstract

COVID-19 pandemic has caused a sudden significant increase in hospitalizations for pneumonia with multiorgan disease.

Objective: To analyze the literature on SARS-CoV-2 and its impact today, in high-impact journals.

Methodology: The search was carried out in Pubmed, Google Scholar, using the terms of "COVID-19", "SARS-CoV-2", "immune response", "transmission routes", "oral manifestations", "treatment", "diagnosis" in conjunction with logical boolean operators OR, AND.

Results: The innate and adaptive immune response are the key to the clinical progress of the infection, transmission is through droplets that are suspended in the air, which goes from the moment a person speaks, coughs or sneezes. Clinical diagnostic test for the detection most widely accepted is the PCR test. Loss of taste is an oral manifestation that is frequently seen in people who are infected with SARS-CoV-2.

Conclusion: The immune response is an important issue to address due to the relationship that SARS-CoV-2 has with the immune system, therefore, it is of utmost importance that there is an effective treatment against SARS-CoV-2.

Keywords: SARS-CoV-2, COVID, etiology, immune response, routes of transmission, oral manifestations, diagnosis, treatment.

1. Introduction

The SARS-CoV-2 disease pandemic has led to a significant and sudden increase in hospitalizations for pneumonia with multiorgan disease [1]. This virus is the cause of COVID-19 disease and the seventh coronavirus to infect humans [2].

The disease caused by SARS-CoV-2 is referred to as coronavirus disease 2019 (COVID-19). Since its first report of patients with atypical pneumonia in December 2019 in Wuhan, China, it was declared a pandemic by the World Health Organization (WHO) on March 11, 2020 [3, 4]. It has infected more than 8 million people, making it a pandemic [5].

It has spread worldwide and has caused severe pulmonary inflammation, acute respiratory distress syndrome (ARDS), cardiac and renal damage, especially in older patients and comorbidities (diabetes mellitus, hypertension and heart failure) [4, 6].

Since the infection usually enters through the mouth, nose and eyes, dentistry is one of the medical practices with the highest risk [7]. SARS-CoV-2 is excreted in the oral cavity and can be transmitted by aerosols. Procedures that generate aerosols in dental health care may increase the risk of transmission of the virus [8].

It is very important to know the cause of SARS-CoV-2 disease, as it is currently a topic that we need to be informed about every single update of this virus.

This review article aims to analyze the literature on SARS-CoV-2 and its current impact, specifically on etiology, immune response, routes of transmission, oral manifestations, diagnosis and treatment.

2. Materials and methods

Articles on the subject published through the PubMed, SCOPUS and Google Scholar

databases were analyzed, with emphasis on the last 5 years. The quality of the articles was evaluated using PRISMA guidelines, i.e., identification, review, choice and inclusion. The quality of the reviews was assessed using the measurement tool for evaluating systematic reviews (AMSTAR-2) [9].

The search was performed using Boolean logical operators AND, OR and NOT.

It was constructed with the words "SARS-CoV-2", "COVID", "etiology", "diagnosis", "immune response", "treatment", "oral manifestations". The keywords were used individually, as well as each of them related to each other. Initially, the titles of all the articles were selected, the abstract of each one was evaluated, and the articles were chosen for a complete reading review.

3. Results and Discussion

3.1 Immune Response

The severity and outcome of COVID-19 could be associated with excessive production of pro-inflammatory cytokines "cytokine storm" leading to acute respiratory distress syndrome [4].

The transition between innate and adaptive immune response is central to the clinical progression of SARS-CoV-2 infection [10] and the destruction of lung cells triggers a local immune response, recruiting infection-responsive macrophages and monocytes, release cytokines and activate adaptive T- and B-cell immune responses [11], as well as the release of interleukin (IL)-1 β and IL-18, which contribute to the pathogenic inflammation responsible for the severity of COVID-19 symptoms [12].

Viral antigens bound to human leukocyte antigen (HLA) serve as an immune signature that can be selectively recognized by T cells [13]. Protective and harmful HLA variants have been described in both mild and severe forms of the disease, but considering the large number of existing variants, the data collected in such a short time span are to some extent confusing and contradictory [14].

Moreover, detection of viral RNA by toll-like receptor (TLR) 3, TLR7, TLR8 and TLR9 activates the NF- κ B pathway and a large number of pro-inflammatory cytokines with an important role in the initiation of virus-induced inflammation [3].

In the first step of virus-host cell interaction when SARS-CoV-2 interacts with the ACE2 receptor highly expressed in type II pneumocytes, a link between the renin-angiotensin system (RAS) and viral pathogenesis is established [15].

The immune response is an important issue to address because of the relationship of SARS-CoV-2 with the immune system, as innate and adaptive immune responses are key to the clinical progression of the infection.

3.2 Transmission Routes

The transmission of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS CoV-2) can be transmitted from person to person through direct contact with an infected individual or indirectly when a person coughs, sneezes, speaks and generates small droplets that remain suspended in the air and can travel up to approximately 1.8 meters. It has also been detected that the virus can be transmitted through contact with contaminated surfaces or fomites [1, 16, 17, 18]. Another possible, but currently unproven, route of transmission is fecal-oral [8, 11].

The most widely accepted route of human-to-human transmission is person-to-person via the respiratory route,

with an incubation period of 1 to 14 days [19].

As mentioned above, as it is transmitted from person-to-person or by indirect droplet contact, it is of fundamental importance in clinical dental procedures and where saliva would play a critical role in the transmission of SARS-CoV-2 in the population [20, 21].

The most widely accepted transmission is currently by droplets that remain suspended in the air, from the moment a person speaks, coughs or sneezes and does it in an incorrect manner. The incubation time of the virus is 1 to 14 days.

3.3 Diagnosis

The diagnostic method of infection, in its acute phase, is based on the detection of viral RNA from clinical samples of infected patients [2]. For this purpose, an RT-PCR technique that detects different constant genomic regions is used by nasal swab [1, 2, 20, 22, 23] and has been the gold-standard test so far [24, 25]. For the detection of IgM and IgG antibodies, ELISA or immune chromatography should be practiced in hospitals [2] in the rapid antigen and antibody tests perform chromatography in a lateral flow assay format and allow easy results to be obtained in 20-60 minutes [23].

The current standard assay for diagnosis is based on RNA extraction from respiratory samples, especially nasopharyngeal swab viral transport media (VTM) [26].

The most widely accepted diagnostic test for the detection of SARS-CoV-2 is the PCR test that consists of obtaining a sample by swabbing the nasopharyngeal tract.

3.4 Oral Manifestations

There have been a few cases of COVID-19 reporting oral manifestations. Since the oral health of patients with COVID-19 may be affected by the infection [27]. Dysgeusia is the first recognized oral symptom of novel coronavirus disease (COVID-19) [28]. It is defined as changes in taste perception in patients infected with COVID-19 and has been frequently observed in the early stages of the disease [29].

Possible mouth-related symptoms include: hypogeusia, chemosensory disturbances and xerostomia [30, 31, 32], the latter has been found mainly in patients with COVID-19, due to the neuro invasive and neurotropic potential of SARS-CoV-2 [30]. All cases had ulcers or blisters in the oral cavity, which are common elementary lesions observed in other viral processes [33] as a result of a deficient immune system and/or susceptible oral mucosa [34].

We can also find oral manifestations such as recurrent herpes simplex, candidiasis and geographic tongue [27], as well as aphthous lesions, burning sensation, tongue depapillation [35] and oral lesions associated with Kawasaki-like diseases (erythema, lip bleeding, "strawberry tongue") [36].

Loss of taste is an oral manifestation frequently seen in people who become infected with SARS-CoV-2, although it is important to mention that not everyone goes through this oral cavity symptom.

3.4 Treatment

There is an urgent need for specific and effective antiviral treatment. Currently, supportive care measures such as ventilation oxygenation and fluid management remain the standard of care [37]. There is no certified drug that has considerable effect on the medical management of patients with COVID-19 [38].

Multiple clinical trials are ongoing for both treatment and prophylaxis [39], as effective therapies are urgently needed to treat coronavirus disease 2019 (COVID-19) [40] we expect

fruitful results very soon [41].

Current therapeutic studies demonstrate the clinical efficacy of Remdesivir in patients with COVID-19 by shortening the time to clinical recovery and hospital stay [42]. Phase III evaluation of remdesivir in the treatment of COVID-19 began in early 2020 and has so far yielded promising results [43]. It is expected that Remdesivir (GS-5734), a viral RNA-dependent RNA polymerase (RdRP) inhibitor can be used to treat a variety of RNA virus infections, and is an effective treatment for SARS-CoV-2 [44].

It is of utmost importance that an effective treatment for SARS-CoV-2 is available, as many people are dying due to the lack of adequate therapeutics to treat the disease.

4. Conclusions

The innate and adaptive immune response are the key to the clinical progression of SARS-CoV-2 infection. The most frequent transmission is by airborne droplets with an incubation time in the body of 1 to 14 days and the most accepted diagnostic test for detection is the PCR test. It is important to mention that loss of taste is an oral manifestation frequently observed in patients, therefore it is of utmost importance to have an effective treatment against SARS-CoV-2.

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