



The Oral Manifestations of SARS-CoV-2, Mucormycosis, and Leukemia in the Current Pandemic

Kaveh Nasiri¹ Aleksandra Dimitrova² Karl-Thomas Wrbas^{3,4}

¹ Essen, Germany

² Department of Hematology, Internal Oncology & Stem Cell Transplant, Evangelical Hospital Essen-Werden, Essen, Germany

³ Department of Operative Dentistry and Periodontology, Center for Dental Medicine, Oral and Maxillofacial Surgery, Medical Center, University of Freiburg, Freiburg im Breisgau, Germany

⁴ Division of Endodontics, Department of Dentistry, Faculty of Medicine and Dentistry, Danube Private University, Krems, Austria

Address for correspondence Kaveh Nasiri, Essen 45138, Germany (e-mail: DDS.Nasiri@web.de).

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Systemic diseases affecting various organs of the body may have signs and symptoms in the oral cavity and saliva. These manifestations can be considered among the symptoms of diseases such as respiratory and hematologic malignancies, immunologic disorders, and fungal and viral infections.¹ Moreover, it has been indicated that some patients with coronavirus disease 2019 (COVID-19), especially those who require ventilator support, are prone to mucormycosis.² Severe acute respiratory syndrome coronavirus type 2 (SARS-CoV-2), mucormycosis, and leukemia have some similar oral manifestations.^{2–4} Therefore, this brief letter focuses on the oral manifestations of these three diseases to help clinicians understand and differentiate these conditions.

A novel respiratory infection, that is, SARS-CoV-2, with an unknown cause was first detected in Wuhan Province, China as a novel coronavirus, in December 2019. Later, the World Health Organization announced it as COVID-19. Subsequently, the results of a study conducted in January 2020, showed that the COVID-19 genome was 96% identical to the genome of a bat coronavirus (RaTG13) and that there has been no evidence of genome manipulation until the publication of the paper. Although it was initially believed that COVID-19 could only affect the respiratory, gastrointestinal, and neurological systems, the oral, olfactory, and integumentary systems were also found to be involved in COVID-19.^{3,5}

The common oral manifestations of COVID-19 include oral lesions, gingivitis, xerostomia, erosive, vesiculobullous eruptions, aphthous, trismus, and particularly gustatory impairment and olfactory disorder.³ Sinjari et al evaluated

the oral manifestations of 20 COVID-19 patients and reported that the most common oral manifestations of COVID-19 were taste disorders (25%), dysphagia (20%), and burning sensation (15%). Furthermore, the most common systemic condition in patients without oral manifestations was hypertension, which was higher among female patients compared with male patients.⁶

Mucormycosis is caused by fungus spores belonging to the Mucorales species. An infection by the Mucoromycotina subphylum, also known as black fungus, leads to high morbidity and mortality. Various risk factors, including poorly controlled or uncontrolled diabetes, cancer, organ transplant, immune dysfunction, corticosteroid and immunosuppressive therapy, human immunodeficiency virus infection, and COVID-19-related conditions (nasal prongs or ventilation support), increase the susceptibility of mucormycosis. Mucormycosis is manifested in the oral cavity by oral mucosa discoloration, asymmetrical swelling, tooth mobility, halitosis, and numbness.²

Leukemia, as a general term referring to cancers originating from white blood cells, is the most common neoplastic disease. Myeloid and lymphoblastic leukemias are the two most common types of leukemia (in both acute and chronic forms) affecting adults and children. The most common oral manifestations of leukemia include gingivitis, spontaneous gum bleeding, petechial, oral ulceration, trismus, and frequent stomatitis.⁴

In addition, the most common type of leukemia in adults is acute myeloid leukemia (AML). Statistics show that the

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United States has over 20,000 cases of AML annually. AML is a heterogeneous disease categorized into three groups: low, moderate, and high risk. The prognosis may vary widely among these groups. Moreover, in some cases, AML might be accompanied by myeloid sarcoma, which is mainly associated with pancytopenia. Some common oral manifestations of AML are bleeding from the gingiva, palate, tongue, and lips; gingival hyperplasia, herpes, candidiasis, chin numbness, tooth pain or mobility, and hemorrhagic bullae on the anterior dorsum of the tongue.^{4,7}

Chronic myeloid leukemia (CML) is a neoplasm in the clonal hematopoietic stem cells, with its main characteristic being increased myeloid lineage cells in the bone marrow. The incidence of CML is 1 or 2 cases per 100,000 adults. Additionally, 8,450 cases have been reported in the United States in 2020. In 2020, the CML mortality rate in the United States was 1,080 cases. Individuals aged between 30 and 50 years are more likely to be diagnosed with CML. This disease can also be accompanied by granulocytic sarcoma. Oral manifestations of CML are rare and mainly due to bone marrow suppression or an advanced stage of the disease, which could include gingivitis and mucosal tissue enlargement.^{4,8}

Acute lymphoblastic leukemia (ALL) is a neoplasm of the lymphoid blood cells that leads to an increased number of immature lymphocytes. It is mainly observed in children and adults. The most common age of ALL patients is between 2 and 5 years old and is more prevalent among the male gender. The prognosis of ALL is satisfactory in children, while it is poor in adults and infants. Approximately 97% of leukemia cases are due to ALL, which also accounts for 80% of acute leukemias. ALL may involve lymphoid tissues of the orofacial area, including tonsils. Oral manifestations include gingival bleeding, ecchymoses, pericoronitis, trismus (at the age of 6 years), oral ulcers, fetor oris, deformation of papillae, and oral infection (e.g., mucositis, candidiasis, herpes, varicella, and cytomegalovirus).^{4,9}

Chronic lymphocytic leukemia (CLL) is the most common type of leukemia in Western countries. CLL accounts for 25 to 35% of all types of leukemia and only 5% of oral involvement. Although the exact etiology of CLL is unknown, several genetic mutations in the deoxyribonucleic acid of hematopoietic cells have been suggested as the etiology of CLL. Clonal expansion of mature CD5⁺ B is a major characteristic

of CLL. Staging can be performed by bone marrow biopsy. Oral manifestations of CLL are more prevalent in the alveolus and buccal areas compared with palatal areas and may include purpura, gingival bleeding, and local swelling with or without ulceration or pain. It is of note that the oral manifestations of CLL are correlated with the stage of the disease.^{4,10}

Regardless of the potential risks of the COVID-19 pandemic, mucormycosis and leukemia can also be life-threatening. If not diagnosed on time, these diseases can be fatal. As stated earlier in this letter, the oral manifestations of various diseases are well known, and sometimes oral manifestations are the first signs of systemic diseases. Thus, the role of clinicians in understanding oral manifestations is crucial in reducing morbidity and mortality in the current pandemic.

Conflict of Interest

None declared.

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