Pro Index | Journal of Innovation in Educational and Social Research
Volume: 2 Issue: 1 Year: 2024
ISSN: 2992-894X | http://journals.proindex.uz

Osteonecrosis of the Jaw after Covid-19

Boymuradov Sh. A., Kurbanov Y. H., Yusupov Sh. Sh., Azadov M. Sh., Asrorova K. S.
Tashkent Medical Academy, Tashkent, Uzbekistan

COVID-19 is currently causing a global pandemic. With the increasing number of patients, there has been a slight rise in the incidence of various complications. Specifically, infectious and inflammatory diseases of the face and jaw are observed in COVID-19 patients during the early infectious stages of the disease as well as in the later stages. Previous literature has mentioned cases where changes in the oral cavity, such as ulcers, rashes, and inflammation of salivary glands, were identified as signs or complications of COVID-19. The conditions discussed in this article represent a serious complication of COVID-19, markedly different from the typical course of osteomyelitis, wherein patients experience a predominance of long-term, chronic-progressive, atrophic processes. The treatment proved somewhat ineffective due to local chronic inflammation and metabolic, microcirculatory, immune, and coagulation disorders in patients.

The course of the new SARS-CoV-2 (COVID-19) is unpredictable and is still under investigation. Although the majority of complications are expected to impact the respiratory system, there have been reports in the literature regarding the adverse effects of the infection on bone and joint tissue. Several complications have been observed in the maxillofacial area in individuals who suffer from the infection, including osteonecrosis and osteomyelitis of the jaw. These complications have been the subject of various hypotheses. They may result either from the disease's pathogenetic mechanism or from a response to the therapeutic modalities used to treat the underlying disease, including the overuse of specific medications such as glucocorticoids, antirheumatics, interleukin-6 inhibitors, and antibiotics. This article presents a case of osteonecrosis of the maxilla following a severe COVID-19 infection.

Many questions regarding the consequences of a COVID-19 infection remain unanswered. Despite the virus falling into the category of respiratory viruses, it can adversely affect multiple tissues and organs. Adverse effects on the pulmonary system include the development of severe acute respiratory syndrome and pneumonia. The severe course of the infection can often lead to complications in other organs, such as heart damage, renal failure, and gastrointestinal disorders [1]. SARS-CoV-2 infection is known to affect the vascular system and the coagulation properties of the blood, damaging vessel walls and causing blood clots to form in both large and microscopic blood vessels [2,3]. Very little is known about complications in the facial area, including osteonecrosis of the maxilla, which can result from impaired microcirculation in this region.

The diagnosis of osteonecrosis of the jaw (ONJ) is primarily clinical. Maxillofacial surgeons commonly use imaging modalities such as CT or MRI for jaw assessment before performing orofacial procedures. Imaging may play a role in determining the extent of the disease, diagnosing early stages of osteonecrosis, and excluding other diseases of the jaws. The CT and MR imaging appearance of ONJ is variable and nonspecific. The CT imaging appearance of bone alterations can include predominantly lytic or sclerotic lesions, periosteal reactions, and pathologic fractures. Persistent alveolar sockets after recent tooth extraction are a common finding in patients with ONJ.

Osteonecrosis of the maxilla is a rare condition. In most cases, it can occur after a traumatic fracture or surgical osteotomy. Other potential causes may include infection, tumors, or radiation. Bisphosphonate osteonecrosis has been reported as a complication in patients who underwent treatment for certain types of bone cancer.

In general, osteonecrosis of the maxilla can occur in cases of vascular compromise. In the course of COVID-19 disease, microcirculation is disrupted; the resulting coagulopathies and microthrombi formation can lead to local ischemia, which is likely to be the cause of osteonecrosis of the jaw. One theory related to the origin of osteonecrosis involves systematic inflammation and the production of large amounts of cytokines—interleukin-1 (IL-1b), gamma interferon (IFN-b), alpha tumor necrosis factor (TNF-α). These cytokines can induce a hypercoagulability state, vasculitis, and thrombosis, while helper and killer T-cells may induce B-cell migration, increased degradation processes, and bone necrosis. Elevated levels of inflammatory cytokines can also reduce the proliferation and differentiation of osteoblasts.

The olfactory and gustatory dysfunction related to COVID-19 has been described as a potential surrogate marker for SARS-CoV-2 infection, sometimes manifesting as a singular symptom of the disease. Additionally, a few isolated cases or short series have reported oral manifestations of COVID-19, such as oral ulcers, petechiae, and reddish spots, primarily on the palate. Desquamative gingivitis and blisters on the lower lip and cheek mucosa have also been observed. Authors have emphasized that these oral lesions hold a distinctive character for early diagnosis and management of the disease. For instance, Soares et al. (2020) found aphthous lesions and multiple reddened macules on the tongue, palate, and cheek mucosa during oral examinations, which healed within three weeks. According to Bianca et al., severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) can infect and multiply in the oral mucosa, resulting in painful oral ulcers. They reported eight cases of COVID-19 infection with necrotic oral ulcers and aphthous ulcers that developed early after dysgeusia occurred, affecting the tongue, lips, palate, and oropharynx. SARS-CoV-2 infects and multiplies in oral keratinocytes and fibroblasts, causing oral ulcers and superficial necrosis. The virus primarily infects oral cells using ACE2 receptors, leading to COVID-19-associated oral manifestations. SARS-CoV-2 binds to the angiotensin-converting enzyme receptor 2 (ACE2), expressed by ACE2 receptors on the oral mucosa and salivary glands, as well as in the gum and periodontal tissues.

The development of osteonecrosis can also be induced by certain drugs. Medication-related osteonecrosis of the jaw (MROJ) is described in the literature concerning the administration of some drugs used in the treatment and rehabilitation of COVID-19. These drugs include certain antirheumatic drugs, monoclonal antibodies (interleukin-6 inhibitors), and corticosteroids. Jawbones are more sensitive to drugs than other bones due to higher vascularization and metabolism in the maxillofacial area, especially in alveolar growth and periodontium, and constant mechanical impact. The adverse effects of the administered drugs occur due to angiogenesis inhibition and weakened innate or acquired immunity, which is accompanied by the existing effects of the infectious process.

The adverse effects of glucocorticoids on skeletal bones are primarily attributed to their direct impact on osteoblasts and osteoclasts. Glucocorticoids increase the apoptosis of osteoblasts while prolonging the lifespan of osteoclasts. This process is associated with increased osteocyte apoptosis, a decrease in vascular endothelial growth factor, impaired skeletal angiogenesis, changes in bone interstitial fluid, and alterations in bone strength. Furthermore, high doses of corticosteroids contribute to elevated levels of Willebrand factor in plasma. Willebrand factor is produced and stored in endothelial cells, so an increase in its concentration can result in endothelial cell damage. Glucocorticoid-induced vascular injuries promote platelet adhesion and aggregation, ultimately leading to thrombosis and avascular necrosis.

There have been reports about the relationship between interleukin-6 inhibitors such as Tocilizumab and Denosumab and medication-related osteonecrosis of the jaw (MROJ), but the exact mechanism of action is not yet well understood.

It is observed that minor injuries, especially tooth extraction, in patients treated with such medications (glucocorticoids or interleukin-6 inhibitors) may contribute to the development of osteonecrosis. Additionally, patients with periodontitis are at a higher risk of developing osteonecrosis.

There is no universally accepted gold standard for the treatment of osteonecrosis of the jaw (ONJ). In some cases, patients are treated with a conservative approach, which includes chlorhexidine mouthwash, long-term antibiotic treatment, periodic minor debridement of sequesters, and wound irrigation to control pain, infection, and the progression of exposed bone. However, conservative treatment tends to have a low success rate.

More aggressive methods, such as complete resection of the affected bone and primary wound closure, have shown a higher success rate.

Summary.

The global COVID-19 pandemic has led to an increase in complications, including infectious and inflammatory diseases affecting the face and jaw. This article explores severe complications, notably osteonecrosis of the maxilla, differing from typical osteomyelitis. COVID-19's impact on various tissues, and organs, and complications like heart damage and renal failure are highlighted. The article discusses adverse effects on the vascular system, coagulation properties, and bone/joint tissues, presenting a case of osteonecrosis post-severe COVID-19 infection.

Microcirculation disruption and coagulopathies may cause osteonecrosis, linked to systemic inflammation and cytokine production. COVID-19-related oral manifestations, such as ulcers and gustatory dysfunction, are explored. Drug-induced osteonecrosis, particularly related to COVID-19 treatment, is discussed, with glucocorticoids' adverse effects on skeletal bones emphasized. Reports on interleukin-6 inhibitors and their relation to medication-related osteonecrosis are mentioned.

The article notes the absence of a standard ONJ treatment. Conservative approaches, including mouthwash and antibiotics, are used, but more aggressive methods, like bone resection, show higher success rates. The text underscores the need for further research to address unanswered questions surrounding COVID-19 complications and their management.

References:

1. Prezioso C., Marcocci M.E., Palamara A.T., De Chiara G., Pietropaolo V. The “Three Italy” of the COVID-19 epidemic and the possible involvement of SARS-CoV-2 in triggering complications other than pneumonia. J. Neurovirol. 2020;26:311–323. doi: 10.1007/s13365-020-00862-z.
2. Christensen RH, Berg RMG. Vascular Inflammation as a therapeutic target in COVID-19 “Long Haulers”: HIITing the spot? Front Cardiovasc Med. 2021;8 doi: 10.3389/fcvm.2021.643626.
3. Østergaard L. SARS CoV-2 related microvascular damage and symptoms during and after COVID-19: consequences of capillary transit-time changes, tissue hypoxia, and inflammation. Physiol Rep.
4. Halboub E, Al-Maweri SA, Alanazi RH, Qaid NM, Abdulrab S. Orofacial manifestations of COVID-19: a brief review of the published literature. Braz Oral Res. 2020;34:e124. doi: 10.1590/1807-3107bor-2020.vol34.0124.
5. Boymuradov S.A., Rustamova D.A., Bobamuratova D.T., Kurbanov Y.X., Karimberdiyev B.I., Yusupov S.Sh., et al. Complications of COVID-19 in the maxillo-facial region: clinical case and review of the literature. Adv Oral Maxillofac Surg. 2021;3 doi: 10.1016/j.adoms.2021.100091. ISSN 2667-1476.
6. Estilo CL, Van Poznak CH, Wiliams T, Bohle GC, Lwin PT, Zhou Q, et al. Osteonecrosis of the maxilla and mandible in patients with advanced cancer treated with bisphosphonate therapy. Oncologist. 2008;13(8):911–920. doi: 10.1634/theoncologist.2008-0091. Epub 2008 Aug 11. PMID: 18695259.
7. Bisdas S, Chambron Pinho N, Smolarz A, Sader R, Vogl TJ, Mack MG. Biphosphonate-induced osteonecrosis of the jaws: CT and MRI spectrum of findings in 32 patients. Clin

Radiol. 2008;63(1):71–77. doi: 10.1016/j.crad.2007.04.023. Epub 2007 Oct 22. PMID: 18068792.

8. Bianchi SD, Scoletta M, Cassone FB, Migliaretti G, Mozzati M. Computerized tomographic findings in bisphosphonate-associated osteonecrosis of the jaw in patients with cancer. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2007;104(2):249–258. doi 10.1016/j.tripleo.2007.01.040. Epub 2007 Jun 7. PMID: 17560140.
9. Cornah J, O'Hare PM. Total maxillary necrosis following severe facial injury. A case report. Br J Oral Surg. 1981;19(2):148–150. doi: 10.1016/0007-117x(81)90042-1. PMID: 6942882.
10. Kramer FJ, Baethge C, Swennen G, Teltzrow T, Schulze A, Berten J, et al. Intra- and perioperative complications of the LeFort I osteotomy: a prospective evaluation of 1000 patients. J Craniofac Surg. 2004;15(6):971–977. doi: 10.1097/00001665-200411000-00016. discussion 978-9.PMID: 15547385.
11. Auluck A. Maxillary necrosis by mucormycosis. A case report and literature review. Med Oral Patol Oral Cir Bucal. 2007;12(5):E360. PMID: 17767099.
12. Reuther T, Schuster T, Mende U, Kübler A. Osteoradionecrosis of the jaws as a side effect of radiotherapy of head and neck tumor patients–a report of a thirty-year retrospective review. Int J Oral Maxillofac Surg. 2003;32(3):289–295. doi: 10.1054/ijom.2002.0332. PMID: 12767877.
13. Estilo CL, Van Poznak CH, Wiliams T, Bohle GC, Lwin PT, Zhou Q, et al. Osteonecrosis of the maxilla and mandible in patients with advanced cancer treated with bisphosphonate therapy. Oncologist. 2008;13(8):911–920. doi: 10.1634/theoncologist.2008-0091. Epub 2008 Aug 11. PMID: 18695259.
14. Du F, Liu B, Zhang S. COVID-19: the role of excessive cytokine release and potential ACE2 down-regulation in promoting hypercoagulable state associated with severe illness. J Thromb Thrombolysis. 2021;51(2):313–329. doi: 10.1007/s11239-020-02224-2. PMID: 32676883; PMCID: PMC7365308.
15. Lacey DC, Simmons PJ, Graves SE, Hamilton JA. Proinflammatory cytokines inhibit osteogenic differentiation from stem cells: implications for bone repair during inflammation. Osteoarth Cartilage. 2009;17(6):735–742. doi: 10.1016/j.joca.2008.11.011. Epub 2008 Nov 24. PMID: 19136283.
16. Radiol Case Rep. 2022 Sep; 17(9): 3228–3232. Published online 2022 Jul 2. doi: 10.1016/j.radcr.2022.06.009 (https://doi.org/10.1016%2Fj.radcr.2022.06.009)