ISSN (O) : 2582-3271
PubMed-National Library of Medicine - ID: 101766917

International Journal of Dental Science and Clinical Research (IJDSCR)

Dr. Angel Vaidic Publication

Available Online at: http://www.ijdscr.org

Volume 3, Issue 3, June - 2021, Page No. : 49 - 54

Because They Can See the Unseen - Role of Oral Radiologists in Diagnosis of Mucormycosis

[1]Dr. Samiksha Chavan, Nair Hospital Dental College, Dr. AL Nair Road, Mumbai Central, Mumbai - 400008, India

[2]Dr. Freny Karjodkar, Nair Hospital Dental College, Dr. AL Nair Road, Mumbai Central, Mumbai - 400008, India

Citation of this Article: Dr. Samiksha Chavan, Dr. Freny Karjodkar," Because They Can See the Unseen-Role of Oral Radiologists in Diagnosis of Mucormycosis.", IJDSCR – June - 2021, Vol. – 3, Issue - 3, P. No. 49-54.

Corresponding Author: Dr. Samiksha Chavan, Nair Hospital Dental College, Dr. AL Nair Road, Mumbai Central, Mumbai - 400008, India

Type of Publication: A Review Paper

Conflicts of Interest: Nil

Abstract

Mucormycosis has been on a rise since the advent of the novel corona virus in its second wave. The infection has a devastating effect on the lives of people who have been affected and those around them. The occult infection is deadly as it manifests only after involving a lot of vital structures. Mouth is the mirror of all systemic diseases. In such a situation, early diagnosis can be established by an oral physician, who on the initial visit itself can catch hold of the disease and prevent further deterioration of the condition. In this paper, we highlight the role of oral radiologists who can see the hidden pathology through radiographs thereby helping in making quick and diagnosis which in turn would help to curb this deadly manifestation of Covid-19 in an effective way.

Keywords

Mucormycosis, Covid-19, Oral radiologist, Diagnosis, Imaging

Introduction

Mucormycosis (phycomycosis, zygomycosis) is a fungal infection which is angio-invasive in nature and one of the most rapidly progressing, specially rhino-orbital-cerebral and pulmonary manifestations and lethal form, caused by ubiquitous filamentous fungi mucorales in humans which usually begins in the nose and para nasal sinuses. It is an opportunistic infection that occurs in patients with compromised immunity or various debilitating systemic diseases. The routes of infection are inhalation, ingestion or contamination of traumatized mucosa like ulcer or extraction socket by fungal spores. It is also residing in fruits, soil, dust, and manure and can be cultured from the nasal mucosa of healthy individuals, where it may not cause clinical signs of infection. Though the organisms are aerobic, they can live for two to five days in vitro. Infection manifests after inhalation through the nose or mouth, however, a

laceration in the skin can also become an entry point for mycotic infection.[1]

With the second wave of COVID-19, India has witnessed a histrionic rise in mucormycosis infection in patients recovered from COVID-19. This association has been documented in the form of several case reports/case series and institutional experiences. The mortality noted in association with this fungal infection is gaining light with its rising severity.[2]

Brimming of hospitals with COVID 19 patients, and the lack of manpower, the reliability of discovering a case through clinical diagnosis and diagnostics falls low, and perhaps this can be an explanation for the higher mortality rate seen now (~87%) as compared to non-covid times (~50%). An erroneous diagnosis, is more harmful to the patient as compared to the wrongly prescribed antibacterial or antifungal drugs which may only aggravate and exacerbate the condition. Hence in this crucial time, physicians must speculate a possible case of Mucormycosis when confronted with slightest possible hints.[3]

Successful management begins with prompt diagnosis, and early diagnosis can be guided by the thought based on elusive clinical features. However, to recognize the signature of mucormycosis, physicians need to a visual experience with the cases. The presenting symptoms associated with the disease are headache, nasal congestion, black crusts in the nose, facial pain, swelling in cheek region and eyes and loss of vision or pain in the eyes. The pulmonary manifestations can be disturbingly similar to those of COVID 19 and influenza which include shortness of breath, cough and fever. Even before the onset of clinical symptoms, it is recommended that clinicians should be aware of patients with risk factors, such as diabetes, any co-morbidities or history of treatment with immunosuppressive drugs, prolonged administration of steroids and oxygen. In contrast, it is noteworthy that plenty of cases have presented with only history of COVID 19 and its recommended steroid therapy with no other risk factors mentioned above, making it a diagnostic enigma.[3]

Dentists are the current frontline diagnosticians as they have an access to the oral cavity and hence can diagnose the disease at an early stage. However, the clinical presentations can mimic several other conditions affecting oral cavity. The destructive lesions of the palate and maxilla can be differentially diagnosed as squamous cell carcinoma, nasopharyngeal carcinoma, peripheral T-cell lymphoma (former-midline lethal granuloma), chronic granulomatous diseases like tuberculosis, tertiary syphilis, Wegener's granulomatosis and other deep fungal infections.[4]

The hallmark of mucormycosis is a black necrotic eschar. However, the absence of this finding or any other clinical finding should not rule out the possibility of mucormycosis.[5]

Radiographs as a part of various diagnostic procedures have been routinely used and documented in various case reports and studies. However, the role of imaging modalities used in oral and maxillofacial radiology for the diagnosis of mucormycosis has not yet been discussed particularly. Hence, we highlight the various imaging modalities used, their importance and thus emphasize the role of oral radiologists in diagnosing this dreaded condition.

Discussion

The different clinical casereports and studies in relation to diagnosis of mucormycosis will be discussed with emphasis on role of radiographic evaluation.

Ananthaneni AR [6] presented a case of mucormycosis with superimposed polymicrobial osteomyelitis. Investigations included intra oral

periapical radiograph (IOPA) in relation to extracted maxillary posterior teeth on right sidewhich revealed enlarged marrow spaces in the edentulous area. Floor of the maxillary sinus wasstill visible. An occlusal radiograph revealed destruction of the anterior hard palate and maxillary alveolar process from midline to right posterior region.Paranasal sinus (PNS) view showed haziness in the right maxillary sinus without clear lateral wall of the sinus.

Bakathir AA [7] reported two cases of mucormycosis of jaw following dental extraction. In one of the case, computed tomography(CT) was used which showed a soft tissue swelling of the right infra-orbital region and marked soft tissue obliteration of the right maxillary sinus, which had started to extend medially causing obstruction of the right medial conchae and invasion of the ethmoidal air cells whereas in other case, panoramic radiograph was advised which showed a non-healing socket of the lower right second molar with evidence of a small area of bone destruction and generalized horizontal bone loss.

Doni B, et al. [8] reported a case of rhinocrebral mucormycosis which used contrast-enhanced CT scan. The coronal section i.e. 3/5 mmof paranasal sinus showed soft tissue density and sclerosis of bony wall with respect to right maxillary sinus and defect in maxillary bone near the floor of right maxillary sinus.

Garlapati K, et al. [9] reported a case of fulminant mucormycosis in maxillofacial region in which radiographic examination on an orthopantomogram revealed opacification of left maxillary sinus. Further, CT scan revealed non-homogenous opacification of left maxillary sinus causing obstruction of left osteomeatal unit extending into middle meatus, ethmoidal, and frontal sinus causing destruction of walls of left maxillary and ethmoidal sinuses.

Afroze, Syeda.et al [10] reported a case of mucormycosis of the maxilla for which orthopantomogram was taken on which no significant changes were noted, whereas a paranasal sinus view (PNS) radiograph revealed haziness of the right maxillary sinus with destruction of the sinus walls. A computed tomography (CT) scan revealed hyper density of the maxillary antrum along with destruction of all the boundaries of sinus including nasal wall and floor of the orbit.

Nilesh K, et al. [11] reported two cases; one of maxillary osteonecrosis secondary to mucormycosis and other of oral mucormycosis subsequent to tooth extraction.In the first case, to study the maxilla and maxillary sinus, Water's view radiograph was advised. The radiograph showed destruction of left maxillary bone extending superiorly to involve the infraorbital rim and laterally to the zygomatic bone. Areas of radiopacity were seen in the left maxillary antrum, indicative of presence of sequestrum.Computed tomography (CT) scan was advised in order to study the extent and location of disease. Sectional views of CT scan revealed thickening of lining of left maxillary sinus, with destruction of anterior maxillary wall.Three-dimensional formatted CT image revealed destruction of anterior maxillary wall extending from the lateral nasal wall to the zygomatic bone and from the maxillary alveolus to just below the infraorbital rim. Area of isolated bone was evident within the lesion suggestive of bony sequestrum. In the second case, orthopantomogram was advised, which showed missing mandibular right posterior teeth, with empty extraction sockets which were indicative of recent extraction. The floor of the right maxillary sinus, in the region of apical aspect of the extraction sockets could not appreciated.

Jacob Therakathu, et al. [12] in a retrospective study, analyzed data of 43 patients to describe imaging features of rhino cerebral mucormycosis.The results after analyzingCT and MR imaging of 43 patients showed principal involvement of the ethmoid and maxillary sinuses. Extension to the orbit and face was seen prior to involvement of the deep skull base and brain. CT revealed minimally enhancing hypodense soft tissue thickening as the prime finding in involved areas, while MRI showed T2 isointense to mildly hypointense soft tissue thickening and heterogeneous post contrast enhancement as the key finding. Bone erosion was seldom noted, with restof the patients showing extra-sinus extension across bones which appear grossly intact on imaging.The conclusions were that imaging showed heterogeneous variable T2W signal intensity, different enhancement patterns and involvement of different sinuses. Patients chiefly presented in the progressive stages of the disease when there is extensive extra-sinus involvement.

Shastry S, et al. [13] reported a case of rhinomaxillary mucormycosis where digital panoramic radiograph showed haziness over right and left maxillary sinus, tooth sockets of right maxillary canine and first premolar. Cone Beam Computed Tomography (CBCT) revealed the following. Maxillary sinus showed complete opacification of left and right maxillary sinus with air entrapment. Medial wall of the left and right maxillary sinus was destructed. Floor of the maxillary sinus was discontinuous on tracingon the right side, but intact on the left side. Right posterior wall of the maxillary sinus was breached but, it was intact on left side. Roof of the maxillary sinus was undamaged on both left and right side.Nasal cavitydisplayed hypertrophy of nasal conchae with disruption of lateral wall of the nose thatwas evident in CBCT. There was complete blockage of left sinus ostium.Deviated nasal septum was noted. Hypertrophy of the left superior, middle and inferior concha on the left side and that of the inferior concha on the right side was notably seen.Ethmoid sinus revealed obliteration of left ethmoid sinus was seen, but right ethmoid sinus did not show any opacification.Sphenoid sinus showed walls of sphenoid sinus were intact without any opacification.Alveolar bone revealed irregular outline of extraction sockets with disruption in the buccal and palatal cortical plates were apparent.

As discussed above, we can decipher that radiographs taken in maxillofacial region are also at par in providing information related to described pathology. The various radiographs discuss here start from a simple IOPA which provide a brief idea of pathology in region of interest, gradually progress towards occlusal view which gives a wider view of the entire palatal area along with the teeth, a quick orthopantomogram can help examine the entire maxillofacial skeleton at a glance giving insights to identify region of interest when not discernable clinically. Radiographs to evaluate paranasal sinuses namely, lateral view, PA angled view (Caldwell view), parietocanthal view (Waters view),transoral parietocanthal view (open mouth Waters view),submentovertex (SMV) view [14] can then be taken to evaluate the invasion or associated changes in the paranasal sinuses in maxillofacial region. CBCT which is much in vogue now has been of immense help with a clear picture of the pathology discussed. The advantage over CT imaging is the reduced radiation exposure and that over MRI is reduced cost factor and application in patients with metallic interventions in their body. Thus, oral radiologists can effectively and successfully deduce appropriate and timely diagnosis in cases of maxillofacial mucormycosis.

Certainly, maxillofacial radiology is limited by the region of study which pertains to head and neck region. This is an obstacle to look deeper into other tissues of the human body thus getting a holistic diagnosis. CT and MRI still remain the standard imaging techniques which can give an insight into the pathological territories throughout the body.

Conclusion

After knowing the role of various radiographs, we are now aware of all the modalities used and their different case-specific findings. The oral radiologist thus has the responsibility to advise appropriate radiographs in suspected cases and in turn provide a prompt diagnosis. The general physicians should also timely refer the patients to oral diagnosticians which would lessen the burden off their shoulders in these testing times. Thus, with a coordinated and a multidisciplinary approach we as one can curb this dreaded enemy in times of pandemic.

References

1. Mengji AK, Yaga US, Gollamudi N, Prakash B, Rajashekar E. Mucormycosis in a surgical defect masquerading as osteomyelitis: a case report and review of literature. Pan Afr Med J. 2016 Jan 26;23:16. doi: 10.11604/pamj.2016.23.16.8394. PMID: 27200123; PMCID: PMC4856500.
2. Jose A, Singh S, Roychoudhury A, Kholakiya Y, Arya S, Roychoudhury S. Current Understanding in the Pathophysiology of SARS-CoV-2-Associated Rhino-Orbito-Cerebral Mucormycosis: A Comprehensive Review. J Maxillofac Oral Surg. 2021 Jun 16:1-8. doi: 10.1007/s12663-021-01604-2. Epub ahead of print. PMID: 34155426; PMCID: PMC8208379.
3. Suvvari TK, Arigapudi N, Kandi VR, Kutikuppala LS. Mucormycosis: A killer in the shadow of COVID-19. J Mycol Med. 2021 May 31;31(3):101161. doi: 10.1016/j.mycmed.2021.101161. Epub ahead of print. PMID: 34146996; PMCID: PMC8165040.
4. Manjunatha BS, Das N, Sutariya RV, Ahmed T. Mucormycosis of the hard palate masquerading as carcinoma. Clin Pract. 2012 Feb 15;2(1): e28. doi: 10.4081/cp.2012.e28. PMID: 24765427; PMCID: PMC3981330.
5. George Petrikkos, Anna Skiada, Olivier Lortholary, Emmanuel Roilides, Thomas J. Walsh, Dimitrios P. Kontoyiannis, Epidemiology and Clinical Manifestations of Mucormycosis, *Clinical Infectious Diseases*, Volume 54, Issue suppl_1, February 2012, Pages S23–S34, https://doi.org/10.1093/cid/cir866
6. Ananthaneni AR, Undavalli SB, Velagapudi RP, Guduru VS. Mucormycosis: an atrocious mate of patients with diabetes. BMJ Case Reports. 2013 May;2013. DOI: 10.1136/bcr-2013-009600.
7. Bakathir AA. Mucormycosis of the jaw after dental extractions: two case reports. Sultan Qaboos Univ Med J. 2006 Dec;6(2):77-82. PMID: 21748139; PMCID: PMC3074926.
8. Doni B., et al, Sequence of oral manifestations in rhino-maxillary mucormycosis, Indian Journal of Dental Research,2011 volume 22, number 2, pages 331-335 doi:10.4103/0970-9290.84313
9. Garlapati K., et al. Fulminant Mucormycosis Involving Paranasal Sinuses: A Rare Case Report Case Reports in Dentistry Volume 2014, Article ID 465919, http://dx.doi.org/10.1155/2014/465919
10. Afroze Syeda, et al. Mucormycosis in a diabetic patient: A case report with an insight into its pathophysiology, Contemporary Clinical Dentistry, Volume 8;4, pages 662-666, doi:10. 4103/ ccd.ccd_558_17

11. Nilesh K, Vande AV. Mucormycosis of maxilla following tooth extraction in immunocompetent patients: Reports and review. J Clin Exp Dent. 2018 Mar 1;10(3): e300-e305. doi: 10.4317/jced.53655. PMID: 29721234; PMCID: PMC5923886.
12. Jacob Therakathu, et al. Imaging features of rhino cerebral mucormycosis: A study of 43 patients, The Egyptian Journal of Radiology and Nuclear Medicine, Volume 49, Issue 2,2018, Pages 447-452, ISSN 0378-603X, https://doi.org/10.1016/ j.ejrnm. 2018.01.001.
13. Shastry S. et al. Cone beam computed tomography: A diagnostic aid in rhinomaxillary mucormycosis following tooth extraction in patient with diabetes mellitus, Journal of Indian Academy of Oral Medicine and Radiology, volume 32;1, pages 60-64,doi:10.4103/jiaomr.jiaomr_12_20.
14. Amanda Er and Andrew Murphy et al.Paranasal sinuses and facial bones radiography https://radiopaedia.org/articles/paranasal-sinuses-and-facial-bones-radiography ,2020, (accessed 24 June 2021).