Manifestações orais em pacientes com HIV detectadas por radiografias panorâmicas: estudo retrospectivo

Oral diseases in HIV patients detected by panoramic radiographs: a retrospective study

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RESUMO
Objetivo: avaliar e descrever a frequência de doenças orais em pacientes infectados pelo HIV por meio de radiografias panorâmicas. Material e Métodos: 27 radiografias panorâmicas foram avaliadas por 6 observadores distintos. Alterações bucais foram descritas em maxila e mandíbula considerando número de dentes perdidos, índice da cortical mandibular, presença de perda óssea horizontal e vertical, envolvimento de furca, calcificações no ligamento estilóide e seios maxilares. Resultados: O número médio de dentes perdidos foi de 7,44 na maxila e 4,96 na mandíbula. O índice da cortical mandibular médio foi 1,73. Observou-se que os pacientes infectados pelo HIV apresentam alta frequência de perda óssea alveolar horizontal em maxila (66,7%) e mandíbula (77,8%). Calcificação do ligamento estilóide parcial estava presente em 29,6% dos pacientes; a frequência de opacificação do seio maxilar foi de 66,7%. Conclusões: Concluímos que pacientes infectados pelo HIV podem apresentar frequência representaativa de perda óssea horizontal e opacificação parcial dos seios maxilares, que podem ser detectadas na radiografia panorâmica.

Palavras-chave: Radiografia panorâmica, Infecções por HIV, Infecções oportunistas relacionadas à AIDS, Diagnóstico Oral.

ABSTRACT
Objective: to assess and describe the frequency of oral diseases in HIV-infected patients using panoramic radiographs. Materials and Methods: A total of 27 panoramic radiographs was evaluated by 6 distinct observers. Oral alterations were described in maxilla and mandible considering number of missing teeth, mandibular cortical index, the presence of horizontal and vertical bone loss, furcation involvement, alterations in styloid ligament and maxillary sinuses. Results: Mean number of missing teeth was 7.44 in maxilla and 4.96 in mandible. Mean MCI was 1.73. It was observed that HIV-infected patients presented high frequency of horizontal alveolar bone loss in maxilla (66.7%) and mandible (77.8%). Partial styloid calcification was present in 29.6% of the patients, maxillary sinus opacification frequency was 66.7%. Conclusions: We concluded that HIV-infected patients may present representative frequency of horizontal bone loss and partial opacification of maxillary sinuses, that can be detected in panoramic radiograph.

Keywords: Panoramic radiography, HIV-infections, AIDS-related opportunistic infections, Oral Diagnosis.

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**INTRODUCTION**

The human immunodeficiency virus (HIV) has infected more than 75 million people worldwide and it is predicted that there are 1.8 million additional infections by HIV each year.\(^1\) HIV is a retrovirus, and it is responsible for the progressive deficiency of the infected patient’s immune system, leading to vulnerability to distinct infections and other immunological alterations, such as the Acquired Immunodeficiency Syndrome (AIDS), which is the expression of HIV infection activity.\(^3\)

Opportunistic infections in AIDS may manifest in oral cavity as early signs, suggesting the patient’s systemic immunity compromise due to HIV infection activity.\(^4,5\) The most prevalent oral manifestations reported in literature are oral candidiasis, hairy leukoplakia, herpes simplex virus infection, Kaposi’s sarcoma, non-specific ulceration or induced by medication, aphthous ulcers, periodontal disease, xerostomia, oral melanotic hyperpigmentation and oral warts.\(^6,7\) Other manifestations that comprise maxilla or mandible, detected using panoramic radiographs have been described for HIV-infected patients as well, such as osteomyelitis at the mandible,\(^8\) and alterations in mandibular bone mineral density.\(^9\)

Panoramic radiographs are the most requested imaging examination in dental clinics routine.\(^10\) This exam offers a great amount of information of teeth and other maxillomandibular structures,\(^8\) and it is considered an important tool in Dentistry.

Hence, the objective of this study is to assess panoramic radiographs of HIV-infected patients in order to describe imaging oral alterations in this group of patients.

**MATERIALS AND METHODS**

**Study participants, inclusion and exclusion criteria**

This retrospective study evaluated imaging examinations of 27 patients with confirmed diagnosis of HIV infection, who underwent digital panoramic radiographic examinations for dental treatment purposes.

Approval was obtained from the Ethics Committee at São Paulo University Dentistry and Medicine School (number 2097.248). The guidelines of Helsinki were followed in this investigation.

Dental imaging examinations analysis were performed independently by 2 experienced radiologists and 4 radiology students two weeks apart to avoid memory bias. Intraobserver reliability was assessed between measurements.

Information considering number of missing teeth, mandibular cortical index (MCI), vertical and horizontal bone loss, furcation involvement, presence of calcification in styloid ligament and opacification in maxillary sinuses were collected.

**Imaging evaluations methodology**

MCI was assessed and categorized according to Klemetti et al.\(^11\) classification which evaluates the mandibular endosteoum according to the presence of radiolucent areas in: C1(normal); C2 (reduced bone mineral density or “osteopenic”) and C3 (moderate to high reduced bone mineral density or osteoporosis).\(^12\) Figure 1 shows this classification.

The presence alveolar bone loss was determined for each tooth considering the morphology of alveolar bone using the digital panoramic radiographs. Angular bony defects, named as “vertical bone loss” were defined as areas in alveolar bone exhibiting radiographic signs of increased bone resorption at either the mesial or distal condition of an interdental periodontitis lesion and had the bottom of the oblique radiolucency ≥2 mm apical to the most coronal level of the interproximal alveolar bone. “Horizontal bone loss” was defined when the marginal alveolar bone morphology was assigned to areas exhibiting
Figure 1: Panoramic radiograph detail demonstrating mandibular cortical index classification. The mandible endosteum from the second premolar to the second molar is classified as: C1 (when the endosteum is well demarcated); C2 (the endosteum presents few radiolucid defects); C3 (the endosteum presents moderated radiolucid defects).

The presence furcation involvement was detected considering the existence of alveolar bone resorption into the bifurcation or trifurcation of a multirooted tooth.14

The presence of styloid ligament calcification was determined as “present” when extending below the mandibular foramen and named as “total” when its radiopacity could be detected in all the ligament extent; and “partial” when the radiopacity was not comprising the whole ligament in all its extent.15

Maxillary sinus opacification was determined using a previously reported classification16 in which the presence of radiopaque areas were categorized as “total” (when the totality of the maxillary sinus cavity was fulfilled by a radiopaque area), “partial” (when the cavity was partial filled) and “mucosal thickening” (when it was recognized in the internal limits of the cavity the continuous thickening its walls). Additionally, the absence of any alteration was also reported.

Results

A total of 27 panoramic radiographs of patients (mean age 51 years old) were evaluated. Five patients were male and 22 were female. Considering lifestyle habits such as chronic alcohol use or tobacco use, only two male patients declared they often use alcohol (twice a week) and only one female was smoker.

Mean number of missing teeth was 7.44 in maxilla and 4.96 in mandible. Mean MCI was 1.73, as expressed in Table 1.
**Table 1:** Descriptive data of HIV-infected patients assessed. Missing teeth (maxilla and mandible) and mandibular cortical index (MCI).

<table>
<thead>
<tr>
<th></th>
<th>Missing teeth in maxilla</th>
<th>Missing teeth in mandible</th>
<th>Total of missing teeth</th>
<th>MCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>7.44</td>
<td>4.96</td>
<td>6.20</td>
<td>1.73</td>
</tr>
<tr>
<td>Median</td>
<td>5.00</td>
<td>4</td>
<td>5.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>5.97</td>
<td>3.66</td>
<td>5.06</td>
<td>0.778</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>3.00</td>
<td>2.50</td>
<td>2.25</td>
<td>1</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.00</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Maximum</td>
<td>16.0</td>
<td>16</td>
<td>16</td>
<td>3</td>
</tr>
</tbody>
</table>

The frequency of periodontal disease, expressed in horizontal and vertical bone loss, is available on Table 2. Horizontal bone loss was more frequent than vertical bone loss; mandible was more affected than maxilla.

**Table 2:** Descriptive data of HIV-infected patients assessed. Frequency of horizontal and vertical bone loss and furcation involvement in mandible and maxilla observed in panoramic radiographs.

<table>
<thead>
<tr>
<th></th>
<th>Horizontal bone loss in maxilla</th>
<th>Vertical bone loss in maxilla</th>
<th>Horizontal bone loss in mandible</th>
<th>Vertical bone loss in mandible</th>
<th>Furcation involvement in maxilla</th>
<th>Furcation involvement in mandible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence</td>
<td>66.7%</td>
<td>37.0%</td>
<td>77.8%</td>
<td>21.2%</td>
<td>11.1%</td>
<td>18.5%</td>
</tr>
<tr>
<td>Absence</td>
<td>33.3%</td>
<td>63.0%</td>
<td>22.2%</td>
<td>78.8%</td>
<td>89.9%</td>
<td>82.5%</td>
</tr>
</tbody>
</table>

In Table 3 the frequency of styloid ligament calcification is exhibited. When present, partial calcification was most prevailed than total calcification.

**Table 3:** Descriptive data of HIV-infected patients assessed. Frequency of calcification in styloid ligament observed in panoramic radiographs.

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Partial calcification 29.6%</td>
</tr>
<tr>
<td></td>
<td>Total calcification 11.1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Absence of 59.3% calcification</th>
</tr>
</thead>
</table>

In Table 4, data about maxillary sinus opacification. The presence of partial opacification of maxillary sinus was observed in 66.7% in patients from this study sample.
**Table 4:** Descriptive data of HIV-infected patients assessed. Frequency maxillary sinuses opacification observed in panoramic radiographs.

<table>
<thead>
<tr>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partial opacification</td>
</tr>
<tr>
<td>Mucosal thinning</td>
</tr>
<tr>
<td>No alterations</td>
</tr>
</tbody>
</table>

**Discussion**

In this study it was observed oral alterations in a group of HIV-infected patients detected panoramic radiographs. The most observed alteration in this group of patients was the presence of horizontal bone loss, which is a result of periodontal disease.

Periodontal diseases are a group of diseases that affect periodontal tissues and alveolar bone loss that can be verified in panoramic radiographs. There is a correlation between loss of periodontal attachment and a reduction in CD4 + T cell count, which increases the risk of periodontal diseases in HIV-infected patients. Furthermore, the immunodeficiency caused by HIV causes an imbalance between microbial attack and the host immune response and may cause destruction of the periodontal tissues. Also, inflammation in gingival tissue can serve as a reservoir for HIV-1 and is an impediment to eradication of the disease.

Literature shows that HIV-infected patients ate at risk of periodontal diseases. Barr et al. and Groenewegen et al. observed that HIV-infected patients present a higher risk of clinical attachment loss and alveolar bone loss when compared to non-infected controls. Vohra et al. in a sample of 100 patients newly diagnosed with HIV, verified that the prevalence of chronic periodontitis was from 8.3% (female patients) till 22.9% (male patients). Muralidharan et al. verified that in a sample of 120 HIV-infected patients, the prevalence of periodontitis presented was 63% of cases, although Souza et al. found a lower frequency of periodontal disease in HIV-infected patients (25.4%). Souza et al. complemented his finding mentioning that age, sex, education, past and current smoking were statistically associated with the presence of periodontitis.

In the present investigation, it was assessed horizontal and vertical bone loss, which are associated to distinct forms of periodontitis. While horizontal bone loss may frequently appear associated to chronic periodontitis, vertical bone loss often is associated to poorer periodontal prognosis even after proper treatment.

Among the present sample findings, low mineral density in mandible also were noticed, as median MCI of the patients was C2. Considering this classification, the median C2 may suggest reduced bone mineral density in mandible among HIV-infected patients. Previously, Nagai et al. found that HIV-Infected patients may present lower bone mineral density compared to non-HIV-infected patients using the same classification in panoramic radiographs.

However, it is known that ageing process leads to decrease in bone mineral density (BMD), and the age of the sample studied may interfere in BMD. Nevertheless, HIV-infected patients present unique bone turnover features. Acquire evidence suggest the bone mineral density in HIV is distinct from normal age-related bone loss noticed in general population as additional physiological changes arising from the HIV infection itself, exposure to antiretrovirals and the immune changes arising from both the medication and HIV infection play an essential role in active bone loss in patients.
HIV-infected, with insights into pathogenesis derived from studies examining markers of bone turnover and bone microarchitecture.\(^{23}\)

Other alteration that can be assessed using panoramic radiographs is the calcification of styloid ligament. In the sample of the present study, it was observed that the frequency of styloid ligament calcification was not high (29.6%). Elongation and calcification of the styloid ligament complex affects approximately 27% of the worldwide population.\(^{24}\) When styloid calcification is present and comprises the entire styloid ligament, it can lead to the development of Eagle syndrome.

Eagle syndrome of styloid syndrome is defined as a symptomatic mineralization (calcification or ossification) or elongation of the styloid process,\(^{25}\) that can result in clinical manifestations similar to temporomandibular disorders.\(^{26}\) The exact etiology of the alteration of the styloid ligament are unknown; however, it was suggested reactive metaplasia, reactive hyperplasia, degenerative processes, or trauma may result in the loss of elasticity in this ligament.\(^{27,28}\)

The great variation in the prevalence observed in the calcification of the styloid process observed in the literature may be the result of different variations in the criteria for diagnosis and interpretation of images.\(^{29,30}\) There is no data in literature regarding the association between HIV-infected patients and styloid syndrome.

Additionally, the present study revealed the presence of sinus abnormalities in 70.4% of the maxillary sinuses evaluated. Opacification was the most frequently observed alteration (66.7%), which may suggest an occurrence of sinusitis related to acute or chronic inflammatory processes.\(^{31}\)

Infections of the paranasal sinus have been reported in HIV-infected patients.\(^{32}\) The frequency is about 6 to 14% according to the literature.\(^{32}\) The mechanism which leads to an increased susceptibility to the development of sinusitis may be related to the decline in immune function.\(^{32}\) The gradual depression of cellular and humoral immunity resulting from HIV infection leads to increased bacterial infection, fungal and viral causes.\(^{33}\)

The limitations of the present study were its retrospective nature, small number of patients in the sample and lack of information considering clinical manifestations of periodontal disease or presence of HIV disease manifestation and the lack of control group.

**CONCLUSIONS**

HIV-infected patients may present representative frequency of horizontal bone loss and partial opacification of maxillary sinuses, that can be detected in panoramic radiograph.

**Funding:** No funding was available for this study.

**Conflict of interest:** Authors declare no conflict of interest.

**Regulatory Statement:** This study was conducted in accordance with all the provisions of the local human subjects oversight committee guidelines and policies of Ethics Committee at Sao Paulo University Dentistry and Medicine School. The approval was obtained: number 2097.248.

**REFERENCES**


May;9(4):428-35. https://doi.org/10.1097/COH.0000000000000080