

Article

PREVALENCE AND MORPHOLOGICAL ANALYSIS OF THE ATHEROMATOUS PLAQUE IN DIGITAL PANORAMIC RADIOGRAPH OF A BRAZILIAN SUBPOPULATION

Prevalencia y análisis morfológico de las placas ateromatosas en radiografías panorámicas digitales de una subpoblación brasileña

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SUMMARY

This study had as a goal to analyze the prevalence of suggestive images of atheromatous calcification in the common carotid artery, aiming to relate it to age, sex, antimere and to analyze the morphology of its calcification, through digital panoramic radiographs of the jaws. It's an observational, transversal and retrospective study, on which there were analyzed 4.837 radiographs, that came from the files of a dental radiology private service in the city of Cabo de Santo Agostinho-PE, Brazil, referring to the period between 2011-2017. The morphology of the calcified atheromatous plaque was classified in: Grade I – normal (plaque not displayed); Grade II – intimal thickening; Grade III – simple plaque (less than 5mm thick); Grade IV – complex plaque (over 5mm thick) and Grade V – debris (irregular plaque with moving projections). The data collected was expressed in absolute values and frequency, analyzed through the chi-square, considering $p < 0,05$. Of the analyzed radiographs, 1.321 filled the eligibility criteria, of these

51 (3,8%) presented suggestive image of atheromatous plaque, 71% were of the female sex ($p = 0,003$), 45% were at the age range between 5th and 6th decade of life ($p = 0,001$), most of the identified plaques were unilateral, to the left ($p = 0,02$) and 76% were morphologically classified as grade III (less than 5mm thick). In this study, it was verified the low prevalence of suggestive images of atheromatous in carotid artery, with greater occurrence on the female sex, between the 5th and 6th decade of life, unilaterally, to the left and morphologically classified in grade III.

Key words: Carotid Arteries; Atherosclerotic Plaque; Panoramic Radiograph; Anatomy; Cardiovascular Diseases.

1. Introduction

The presence of cardiovascular alterations has been quite frequent on the population, atherosclerosis being the most common among them, affecting mainly older people of both sexes, although younger people may also be affected. Among the clinic manifestations resulting from atherosclerosis are: coronary artery disease, carotid atherosclerotic disease and Cerebral Vascular Accident (CVA), which constitutes the third greater death cause in the world (Silva et al., 2013; Brasileiro Junior et al., 2014; Solano et al., 2018).

The Cerebral Vascular Accident (CVA) is considered a priority for public health due to the high mortality rates (20 to 35%) and high potential of incapacitation for the productive life. Over 50% of the ischemic CVAs are caused by blood clots that develop in the carotid. The risk factors can be classified in three types: 1) endogenous or intrinsic factors: sex, heredity and age; 2) exogenous or extrinsic factors: sedentarism, smoking, diet and consumption of alcoholic beverages; 3) combined factor: diabetes mellitus, psychosocial factors, left ventricular hypertrophy, obesity, arterial hypertension, previous history of transitory ischemia or CVA and high cholesterol rate (Yamashita et al., 2015).

The atheromatous plaque or atheroma affects more often the aorta, coronary and cerebellar arteries. On the cerebrovascular sector, they are located mostly, on the carotid bifurcation and origin of the internal carotid artery (Carvalho et al., 2010). Its presence happens by the fat deposition on the blood vessels lumen, decreasing the blood flow that goes through that region and, consequently, decreasing the oxygen levels on the tissues, what requires fast treatment in order not to aggravate and result in urgency and/or death (Alie et al., 2015). The calcified atheromas are formed by depositions of calcium salts and can be visualized on the radiographs depending on the evolution time, the more evolved they are, the more perceptible on the image. When present on the common carotid artery, they are described as radiopaque images with halo, well defined limits and located on the cervical vertebrae C3 and C4 area, next to the triticeal cartilage (Silva et al., 2013; Soares et al., 2015).

The prevalence of Calcification on the Carotid Artery (CCA) may vary from 2 to 5% in neurologic asymptomatic patients, who are over 55 years old. However, when people with special conditions were evaluated, like: menopause women, who were submitted to radiotherapy, or who had kidney diseases, mellitus diabetes type 2, the prevalence increases, being able to reach 20% (Garay et al., 2014).

The atheromatous plaque may be classified as to its morphology, in grades, according to its size (Katz et al., 1992). Montgomery et al. (1996) Classified the atheromatous plaque and made an association with scale and pathologic risks in: Grade I - normal (plaque not displayed); Grade II - intimal thickening; Grade III - simple plaque (less than 5mm thick); Grade IV - complex plaque (over 5mm thick) and Grade V - debris (irregular plaque with moving projections), the last grade being associated to a high risk factor to intraoperative embolic cerebral events, which results in

displacement of atheroma and thrombi which suffer bleeding or rupture, leading to an “accident of the plaque of atheroma”, with the formation of a clot on this place (Katz et al., 1992; Vianna et al., 2016; Reis 2019).

Friedlander and Land, in 1981, were the first to describe the panoramic radiography as a mean to help in the identification of patients with risk to develop CVA, emphasizing the importance of this exam, very used on the routine of the dental practice, on which, in many cases, the identification of CCA is and accidental finding. (Barros et al., 2011). This exam allows the visualization of the whole dentoalveolar region and adjacent structures in one film, with images made in small cuts or sliced areas without overlapping of the structures located above or below the cut. Without the overlapping of the structures, it is possible to visualize the plaques of atheroma through radiopacity images with different shape on the soft tissue (Freitas et al., 2009; Abreu et al., 2011). These aspects motivated the recent research, which aimed to evaluate the prevalence of atheroma on the common carotid artery on digital panoramic radiography (DPR) of a Brazilian subpopulation, relating it to age, sex, antimere and to analyze the morphology of its calcification.

2. Material and methods

This research is linked to the project entitled: “*Análise Morfológica da Placa Ateromatosa em radiografia panorâmica digital*” (Morphologic Analysis of the Atheromatous Plaque), it is registered on the Ethics Committee in Research with Human Beings of the Universidade Federal de Pernambuco (UFPE) (Federal University of Pernambuco), Brazil, according to the Resolution N° 466/12, of the National Health Council and it is approved with CAAE N°. 4411.6615.0000.5208.

It is an observative study, transversal and retrospective. The research was developed in a private service of dental radiology private service in the city of Cabo de Santo Agostinho-PE, Brazil, referring to the period between 2014-2017. For the image selection, the sample calculation was based in a non-probabilistic sample (convenience), taking as a base, the clinic files of the period 2011-2017, which were 4.837 digital panoramic radiographs. The imaging findings were selected using the following criteria of eligibility and inclusion – it had to be from people of age range between 50-80 years old and radiographs that obeyed to the program of quality control in dental radiology, with minimum grade of distortion, medium grade of contrast and maximum sharpness; As an exclusion criteria, it was considered the presence of stent on the carotid; a differential diagnose of calcification was performed on the process stylohyoide, thyroid cartilage, cricoid cartilage, tritric cartilage, phleboliths, hyoid bone, calcified lymph nodes, and tonsilloliths.

The digital panoramic radiograph images were obtained in a Dabi Atlante machine of 3 axes, panoramic model Eagle Digital, they were stored in a server and were evaluated through a CDT software of the CDT brand, which made it possible to adjust contrast and brightness to optimize the visualization of the anatomic accidents. The radiographs were evaluated by two examiners, one dental surgeon, who is a radiology specialist, and a general dental surgeon previously calibrated and properly qualified to the identification of mineralization on the carotid artery, taking into consideration the differential diagnose of anatomic structures on the neck area and calcified lesions. We used a notebook HP G60, of 17 inches screen, in a darkened environment, for a better visualization and the ImageJ software, with adjusted measures according to the DPR proportions, to attain an average over the length and width measurement of the suggestive image of the visualized calcifications of the carotid artery. Following the following steps:

1st Step: Select the radiographs that fill the eligibility criteria.

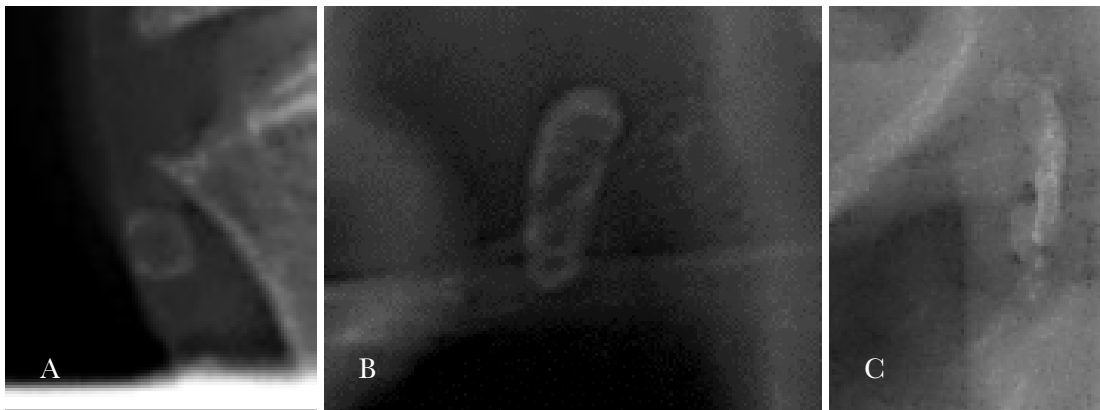
2nd Step: Analyze the presence of atheromatous plaque on the cervical vertebra area (C3 e C4), compare and confirm its description on the radiograph report, evaluating also, the presence or absence of mineralization on the carotid artery, the presence being determined by observing vertical and linear heterogeneous radiopacity adjacent to the hyoid bone, epiglottis and cervical vertebra above, to the high or below the same intravertebral space.

Some radiopaque structures which resemble the plaques of atheroma in digital panoramic radiographs were considered as differential diagnose, including: calcification on the process stylohyoide, thyroid cartilage, cricoid cartilage, tritricartilage, phleboliths, hyoid bone, calcified lymph nodes and tonsilloliths.

3rd Step: Morphologically analyze the detected plaque on the scale proposed by Montgomery et al. (1996), who made a study in transesophageal echocardiography and classified it in: Grade I – normal (plaque not displayed); Grade II – intimal thickening; Grade III – simple plaque (less than 5mm thick); Grade IV – complex plaque (over 5mm thick) and Grade V – debris (irregular plaque with moving projections). The collected data was noted in clinic records developed by the researcher for this research (Image 1).

Image 1.

Morphology of the atheromatous plaque. A) Grade III (< 5mm); B) Grade IV (> 5mm); C) Grade V (irregular or amorphous).



Statistics Analysis:

The data was compiled in a Microsoft Excel™ worksheet, descriptive statistics was done to obtain the measures of central tendency and dispersion. The data was expressed through absolute values and frequency and analyzed through the significance test of chi-square, considering $p < 0,05$, through SPSS software version 20.

3. Results

After the application of the eligibility criteria, 1.321 radiographs were selected, of these 51 (3,8%) presented suggestive image of calcification on the carotid artery (CCA) (Image 2). Table 1 presents the factors associated to the identification of atheromatous plaques, on which 45% belonged to people with age range between 50 to 60 years old, 71% female sex, most of the atheromatous plaques identified were unilateral and mainly to the left ($p=0,02$) (Table 1).

Image 2.

Flowchart of the study for the selection of the final sample.

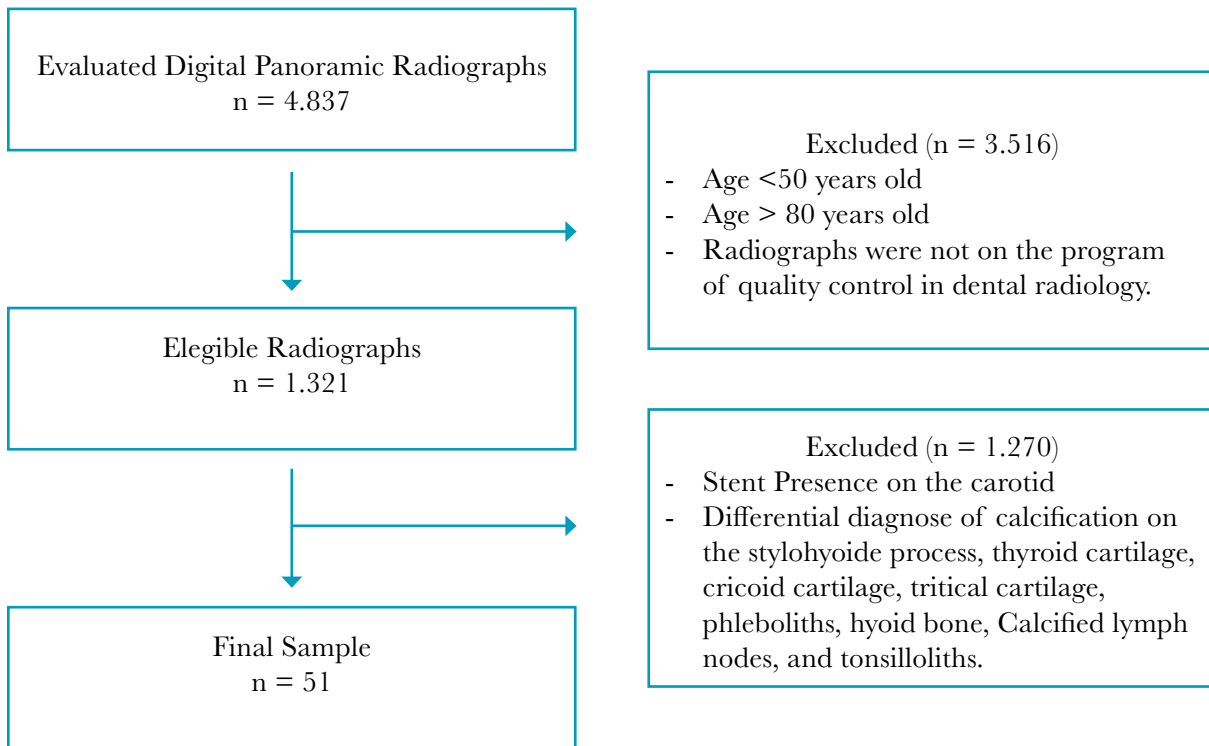


Table 1.

Factors associated with the identification of the atheromatous plaques, Cabo de Santo Agostinho-PE, Brazil, 2017.

Associated Factors	n (%)	P- value ¹
Decades of life		
50-60 years	23 (45)	
60-70 years	16 (31)	0,001*
70-80 years	9 (18)	
80-90 years	3 (6)	
Sex		
Female	35 (71)	0,003*
Male	16 (29)	
Laterality		
Unilateral	34 (67)	0,02*
Bilateral	17 (33)	
Antimere		
Right	9 (18)	
Left	25 (49)	0,02*
Both	17 (33)	

Value of P¹: Chi-Square Test

*P<0,05

Regarding its morphology, it was verified that there was greater correspondence to atheroma class III (< 5 mm) in 39 cases (76%), of these 33 (84%) were unilateral. Highlight, it was also verified a significative rate of bilateral images with greater correspondence of atheromas class III and V (amorphous) in 4 (24%) of the analyzed DPR.

4. Discussion

The prevalence of suggestive image of calcified atheroma on the carotid artery in digital panoramic radiographs, on this study, was considered low. Almog et al. (2002) It was related that the prevalence of atheroma observed by panoramic radiographs is usually described in up to 5%, with greater occurrence in patients with clinic conditions associated to atherosclerosis. The present study showed a percentual that corroborates such finding and, for having a non-intentional sample recruitment, clinic data was not obtained, which can explain the different prevalence in comparison to other investigations. Regarding the epidemiologic data about the world prevalence of CCA in panoramic radiographs, it was reported results similar to the present study in Germany, Saudi Arabia and Japan (Lee et al., 2013; Willig e Solda, 2016). In Brazil, the biggest study evaluated 8.338 panoramic radiographs. It was performed on the South region and it showed a prevalence of CCA of 6,9% (Rocha et al., 2016).

As for the age range, the greatest occurrence was observed between the 5th and 6th decade of life. Similar results were obtained by Masson et al. (2017), who analyzed the discordant lipidic pattern and carotid atherosclerotic plaque, finding average age of 52 (\pm 11) years old. Sitrângulo Junior e Silva (2018) highlighted the proportional increase of the prevalence of carotid atherosclerosis related to the one's age and that at 65 years old, around 5% of the people present the disease.

Considering sex, it was observed the predominance of calcified images in radiographs of the female sex. Similar results were obtained on the studies performed by Garay et al. (2014) and Santos (2018) who found prevalence of 60,7% and 70,8% respectively. This data may corroborate the fact that menopausal women present low rate of estrogen and that this hormone causes low density cholesterol molecules to brake (*Low Density Lipoproteins* - LDL) and reduction of the rates of circulating high density cholesterol (*High Density Lipoproteins* - HDL), increasing the chances of atheroma formation (Guimarães et al., 2011; Varri et al., 2016; Vianna et al., 2016). However, differently of the quoted findings, other authors like Kamak et al. (2015), Brasileiro Junior et al. (2014) and Damiani et al. (2014) observed greater predominance of atheroma on the male sex, 50,3%, 58,82%, and 32,3% respectively. The authors describe that this fact can be justified, because some atheromatous lesions develop with time and men are more affected than women, mostly if they are alcoholics.

Regarding laterality, it was observed greater incidence of unilateral CCAs. Corroborating with such findings, Ezoddini et al. (2014), Kamak et al. (2015) and Mejía e Jesus (2016) identified unilateral carotid calcification in 70%, 65,85% and 10,2% respectively. This data differs of the findings of Uthaman e A-Saffar (2008), which identified greater number of cases with carotid calcification bilaterally, of 62 radiographs studied, 64,51% presented suggestive image of carotid artery calcification.

On the present study, antimere had greater prevalence on the left side, corroborating with the findings of Amorim e Wermelinger (2019), on which 77% of fourteen cases were associated to the left side, and Kamak et al. (2015) with 33,33% of 156 images. In contrast, divergences were found regarding the data found by Gonçalves et al. (2017), on which was found a greater number of CCA on the right side in 90 (49,45%) of the 181 calcifications found Santos et al. (2018) with 37,6% of the cases.

As for the morphological analysis of the suggestive images of atheromatous plaque on the research, grade III obtained greater prevalence, followed by grades V and IV, on this order. In the

studies of Montgomery et al. (1996) atheromatous plaques were classified in: 62 patients Grade III, 19 patients Grade IV and 14 patients Grade V and in the studies of Katz and co-workers (1992), it was found 23 people Grade III, 11 Grade IV and 12 Grade V, this data serves as base to the referent research when analyzing the morphology of the atheromatous plaques on the aorta artery performed on transesophageal echocardiography, having found the greatest number of atheroma on grade III prevalent on both quoted researches, corroborating the results found on the present study.

The morphology of the plaque of atheroma is dynamic, with frequent formation and resolution of the movable components. Based on this, the atheroma can still be classified in simple or complex plaques through transesophageal echocardiography exams (Haruki et al., 2010). The simple atheroma has greater chance to have intimal thickening and calcification areas. The complex atheroma is defined as being an atherosclerotic plaque with peduncular or movable and/or protruding components, with limit of 4 mm of protrusion towards the interior of the arterial light. The atherosclerotic disease with movable and protruding components has greater chance of being associated to the cardioembolic disease than the smooth atheroma in crescent format (Vianna et al., 2016).

As for the existence of structures characterized as differential diagnose to atherosclerotic plaque, Santos, his co-workers (2018) and Rocha et al. (2016) discuss about the utilization of digital panoramic radiographs to evidence suggestive images of carotid atheromas in symptomatic and asymptomatic patients, but Soares et al. (2015), Vianna et al. (2016) and Bastos et al., (2018) highlight that it is necessary to perform more specific exams, such as Doppler ultrasonography, digital angiography, computerized tomography and, in other cases, transesophageal electrocardiogram, which has the ability to reveal high risk atheroma plaques with movable thrombus and images in real time. From these, Doppler ultrasonography is the most indicated exam for the confirmation of the differential diagnose of the presence, location and size of the carotid atheroma, besides that it is a low cost and low radiation risk exam, when compared to angiographic contrasts, computerized tomography and transesophageal electrocardiogram (Willig e Solda, 2016).

The study limitation was that panoramic radiology can be used on the identification of suggestive images of calcification on the carotid artery, but it doesn't define the degree of obstruction and the exact location of the atheroma, which makes it necessary to have other image exams and lab exams for a complete diagnose. Besides that, it is important to highlight the need of attention to the differential diagnoses with other radiopaque anatomic and pathologic structures, which may be found on the same topographic region. Even so, it is reinforced that digital panoramic radiographs, for being an exam very requested on the Odontology routine, serve as means to help on the analysis of suggestive images of atheroma, making it possible to refer the patient to prevention or to a more adequate treatment of cardiovascular diseases.

5. Conclusion

In this study, it was verified the low prevalence of suggestive images of atheroma in carotid artery identified in panoramic radiographs of the jaws, with greater occurrence on the female sex, between the 5th and 6th decade of life, unilaterally, to the left and morphologically classified grade III (< 5 mm).

References

Abreu, T.Q., Brito Filho, S.B., Sales, K.P.F. Spyridis, K.S. and Oliveira, A.E.F. (2011) "Radiografia Panorâmica como Possível Método de Diagnóstico de Pacientes com Risco de Acidente Vascular

- Cerebral: Revisão da Literatura”. *Pesq Bras Odontoped Clin Integr.* 11, 607-12. Available: <https://pesquisa.bvsalud.org/riipsa/resource/pt/lil-663273> [Accessed 22 July 2020].
- Amorim, A.G.G. and Wermelinger, A.C.C. (2019) “Correlação entre Aterosclerose Carotídea e Disfunção Ventricular Esquerda ao Ecocardiograma”. *Arq Bras Cardiol: Imagem cardiovasc.*, 32, 6-13. Available: <http://departamentos.cardiol.br/dic/publicacoes/revistadic/revista/2019/portugues/Revista01/revista-abc-imagem-original-3201-258.pdf> [Accessed 21 July 2020].
- Alie, N., Eldib, M., Fayad, Z.A. and Mani V. (2015) “Inflammation, atherosclerosis, and coronary artery disease: PET/CT for the evaluation of atherosclerosis and inflammation”. *Clin Med Insights Cardiol.*, 8, 13-21. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4294600/> [Accessed 20 July 2020].
- Almog, D.V., Horev, T., Illig, K.A., Green, R.M. and Carter, L.C. (2002) “Correlating carotid artery stenosis detected by panoramic radiography with clinically relevant carotid artery stenosis determined by duplex ultrasound”. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.*, 94, 768-73. Available: <https://pubmed.ncbi.nlm.nih.gov/12464905/> [Accessed 22 July 2020].
- Barros, R.Q.A.B., Oka, S.C.R., Holmes, T.S.V., Cavalcanti, A.L., Bento P.M., and Godoy, G.P. (2011) “Diagnóstico precoce de ateromas por meio de exames radiográficos rotineiros em odontologia: considerações atuais”. *Odontol. Clin.-Cient.*, 10, 129-31. Available: http://revodonto.bvsalud.org/scielo.php?script=sci_arttext&pid=S1677-38882011000200006 [Accessed 22 July 2020].
- Brasileiro Junior, V.L., Luna, A.H.B., Sales, M.A.O., Rodrigues, T.L.C., Sarmento P.L.F. and Mello Junior, C.F. (2014) “Confiabilidade da radiografia panorâmica digital no diagnóstico de calcificações na artéria carótida”. *Radiol. Bras.*, 47, 28-32. Available: http://www.rb.org.br/detalhe_artigo.asp?id=2498&idioma=Portugues [Accessed 20 July 2020].
- Carvalho A.C.A., Oliveira L.S.A.F., Melo D.P., Rabello I.C. and Campos P.S.F. (2010) “Desenvolvimento de placas de ateroma em pacientes diabéticos e hipertensos”. *R. Ci. méd. biol.*, 9, 73-7. Available: <https://repositorio.ufba.br/ri/bitstream/ri/1446/1/3509.pdf> [Accessed 10 September 2020].
- Damiani, I.T., Rubens José, G., Milberto, C. (2004) “Influência do etanol das bebidas alcoólicas na aterosclerose em artérias carótidas extracranianas”. *Arq. Neuro-Psiquiatr.*, 62, 1022-26. Available: https://www.scielo.br/scielo.php?pid=S0004-282X2004000600017&script=sci_abstract&tlng=pt [Accessed 21 July 2020].
- Freitas, P., Piccinato, C.E., Martins, W.P. and Mauad Filho, F. (2009) Aterosclerose carotídea avaliada pelo eco-Doppler: associação com fatores de risco e doenças arteriais sistêmicas *J. vasc. bras.* 7, 298-306. Available: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S1677-54492008000400003&lng=pt&nrm=iso [Accessed 22 July 2020].
- Friedlander A.H. and August, M. (1998) “The role of panoramic radiography in determining an increased risk of cervical atheromas in patients treated with therapeutic irradiation”. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 85, 339-44. Available: <https://pubmed.ncbi.nlm.nih.gov/9540095/> [Accessed 22 July 2020].
- Garay I., Netto H.D. and Olate S. (2014) “Soft tissue calcified in mandibular angle area observed by means of panoramic radiography”. *Int J Clin Exp Med.*, 7, 51-6. [Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3902240/>] [Accessed 20 July 2020].
- Guimarães, G.O., Guimarães, I.E.O. Junior, D.N., Calderón, J.C.M. and Saddy, M.S. (2005) “Radiografia panorâmica: identificação de pacientes suscetíveis ao acidente vascular cerebral por meio da detecção de ateromas na bifurcação da carótida”. *ConScientiae Saúde*, 4, 97-104,. Available: <https://>

- periodicos.uninove.br/index.php?journal=saude&page=article&op=view&path%5B%5D=422 [Accessed 21 July 2020].
- Gonçalves, S.L., Damasceno, J.O.L., Picoli, F.F. Bueno, J.M. and Mundim-Picoli, M.B.V. (2017) “Avaliação de prevalência de calcificação da artéria carótida em radiografias panorâmicas na população goiana”. *Sci Invest Dent*, 22, 70-75. Available: https://www.researchgate.net/publication/321791180_Avaliacao_de_prevalencia_de_calcificacao_da_arteria_carotida_em_radiografias_panoramicas_na_populacao_goiana [Accessed 21 July 2020].
- Haruki, N., Takeuchi, M., Kaku, K. Yoshitani, H. Tamura, M., Abre, H., Okazaki, M., Ota, T. and Otsuji, Y. (2010) “Prevalence and Clinical Implication of Complex Atherosclerotic Plaque in the Descending Thoracic Aorta of Japanese Patients Assessed by Transesophageal Echocardiography”. *Official Journal of the Japanese Circulation Society*, 74, 2627-32. Available: https://www.jstage.jst.go.jp/article/circj/74/12/74_CJ-10-0288/_article/-char/en [Accessed 21 July 2020].
- Jácome, A.M.S. Abdo, E.N. (2010) “Aspectos radiográficos das calcificações em tecidos moles da região bucomaxilofacial”. *Odontol. Clín.-Cient.*, 9, 25-32. Available: http://revodonto.bvsalud.org/scielo.php?pid=S1677-38882010000100005&script=sci_arttext [Accessed 22 July 2020].
- Kamak, G., Yildirim, E. and Rencban, E. (2015) “Evaluation of the relationship between periodontal risk and carotid artery calcifications on panoramic radiographs”. *Eur J Dent.*, 9, 483-9. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4745228/> [Accessed 21 July 2020].
- Masson, W., Lobo, M., Molinero, C. and Siniawski C. (2017) “Padrão Lipídico Discordante e Placa Aterosclerótica Carotídea. Importância do Colesterol Remanescente”. *Arq Bras Cardiol.*, 108, 526-32. Available: https://www.scielo.br/scielo.php?pid=S0066-782X2017000600526&script=sci_arttext&tlng=pt [Accessed 22 July 2020].
- Medrando, S. and Alejandro M. (2018) “*Frecuencia de calcificaciones de tejidos blandos en radiografias digitales de pacientes mayores de 18 años atendidos en el centro de diagnóstico radiológico imagenes estomatológicas*”. Completion of Course Work. Universidade Nobert Wiener. Available: <http://repositorio.uwiener.edu.pe/bitstream/handle/123456789/1488/TITULO%20-%20Solano%20Medrano%2C%20Manuel%20Alejandro.pdf?sequence=1&isAllowed=y> [Accessed 20 July 2020].
- Mejía A. and Jesus, M. (2016) “*Calcificaciones de tejidos blandos más frecuentes en radiografias panorámicas dentales digitales. Centro de Diagnóstico Integral San Isidro*”. Master’s Thesis. Universidad Nacional Mayor de San Marcos. Available: <https://www.semanticscholar.org/paper/Calcificaciones-de-tejidos-blandos-m%C3%A1s-frecuentes-Mej%C3%ADa-Jesus/be4fb24284b74b59e6d8bebad44a079fce76100a> [Accessed 21 July 2020].
- Montgomery, D.H., Ververis, J.J., McGorisk, G., Frohwein, S., Martin, R.P. and Taylor W.R. (1996) “Natural History of Severe Atheromatous Disease of the Thoracic Aorta: a transesophageal echocardiographic study”. *J Am Coll Cardiol.*, 27, 95-101. [Available: <https://www.sciencedirect.com/science/article/pii/S0735109795004319>] [Accessed 20 July 2020].
- Lee, J.S., Kim, O.S., Chung, H.J., Kim, Y.J., Kweon, S.S., Lee, Y.H., Shin, M.H. and Yoon, S.J. (2013) “The prevalence and correlation of carotid artery calcification on panoramic radiographs and peripheral arterial disease in a population from the Republic of Korea: the Dong-gu study”. *Dentomaxillofac Radiol.*, 42, 1-6. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3667535/> [Accessed 22 July 2020].

- Reis, S.C. (2019) "Uma revisão bibliográfica sobre aterosclerose". *Electronic Journal Scientific Collection*, 2, 1-6. Available: <https://www.acervomais.com.br/index.php/cientifico/article/view/444/253> [Accessed 20 July 2020].
- Rocha, T.G., Michels, M., Guimarães, L.N.M., Guedes F.R., Visconti, M.A.P.G. and Vieira, A.C.D. (2016) "A multidisciplinary approach on the diagnosis of carotid artery atheromas: a case report". *Odontol. Clín.-Cient.*, 15, 141-4. Available: http://revodonto.bvsalud.org/scielo.php?pid=S1677-38882016000200013&script=sci_arttext [Accessed 22 July 2020].
- Rubins, A.R. (2011) "*Radiografias Panorâmicas e Calcificações em Tecidos Moles*". Master's Thesis. Universidade Federal do Rio Grande do Sul. Available: <https://lume.ufrgs.br/handle/10183/49846> [Accessed 22 July 2020].
- Santos, J.M.O., Soares, G.C., Alves, A.P.N.N., Kurita, L.M. Barros Silva, P.G. and Costa, F.W.G. (2018) "Prevalence of carotid artery calcifications among 2,500 digital panoramic radiographs of an adult Brazilian population". *Med Oral Patol Oral Cir Bucal*, 23, 256-61. Available: <http://www.medicinaoral.com/medoralfree01/aop/22350.pdf> [Accessed 21 July 2020].
- Silva, F.C.S., Silveira, O.S., Francio, L.A. and Manze, F.R. (2013) "Utilização de radiografia panorâmica digital como meio auxiliar na identificação de ateromas em pacientes com risco de desenvolver um acidente vascular cerebral". *R. CROMG*, 14, 39-43. Available: <http://revista.cromg.org.br/index.php/rcromg/article/view/79> [Accessed 20 July 2020].
- Soares M.Q.S., Castro Jr., R.C., Santos P.S.S., Capelozza A.L.A. and Fischer-Bullen, R. R. (2015) "Contribuição da radiografia panorâmica no diagnóstico de calcificação de ateroma de carótida: relato de caso e revisão da literatura". *Rev Port Estomatol Med Dent Cir Maxilofac.*, 56, 127-31. Available: <https://www.sciencedirect.com/science/article/pii/S164628901500045X?via%3Dihub> [Accessed 20 July 2020].
- Tunãs, I.T.P., Santos, E.J.C., Veiga, L.M., Deluiz, L.F. and Weyne, S.C. (2012) "Carotid atheromas in panoramic radiographs: how can the general practitioner identify?". *Rev. bras. odontol.*, 69, 203-6. Available: http://revodonto.bvsalud.org/scielo.php?script=sci_arttext&pid=S0034-72722012000200013 [Accessed 20 July 2020].
- Uthman, A.T. and Al-Saffar, A.B. (2008) "Prevalence in digital panoramic radiographs of carotid area calcification among Iraqi individuals with stroke-related disease". *Oral and Maxillofacial Radiol.*, 105, e68-e73. Available: <https://www.sciencedirect.com/science/article/abs/pii/S1079210407008529> [Accessed 21 July 2020].
- Vianna, L.B., Melo, J.C.V., Correa, G.J. and Itabaiana Sobrinho, S. (2016) *Ortho. Sci., Orthod. sci. Pract.*, 9, 111-7. Available: <https://pesquisa.bvsalud.org/portal/resource/pt/lil-784585> [Accessed 20 July 2020].
- Varri, M., Niskanen, L., Tuomainen, T.P., Honkanen, R., Kroger, H. and Tuppurainen, M.T. (2016) "Association of adipokines and estradiol with bone and carotid calcifications in postmenopausal women". *Taylor & Francis*, 19, 204-11. Available: <https://www.tandfonline.com/doi/full/10.3109/13697137.2016.1139563?scroll=top&needAccess=true> [Accessed 21 July 2020].
- Willig, M.M.P., Solda, C. (2016) "Ateroma de carótida: revisão de literatura". *J Oral Invest*, 5, 53-8. Available: https://www.researchgate.net/publication/315938829_Ateroma_de_carotida_revisao_de_literatura [Accessed 22 July 2020].

Yamashita, T., Sasaki N., Kasahara, K. and Hirata, K. (2015) "Anti-inflammatory and immunomodulatory therapies for preventing atherosclerotic cardiovascular disease". *J Cardiol.*, 66, 1-8. Available: <https://pubmed.ncbi.nlm.nih.gov/25744783/> [Accessed 20 July 2020].

Sitrângulo Junior, C.J. and Silva E.S.(2018) "Doença aterosclerótica carotídea". *Jornal Vascular Brasileiro*, 17, 179-83, 2018. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6326131/> [Accessed 22 July 2020].

RESUMEN

Este estudio tuvo como objetivo analizar la prevalencia de imágenes sugerentes de calcificación ateromatosa en la arteria carótida común, con el objetivo de relacionarla con la edad, sexo, antimería y analizar el aspecto morfológico de la calcificación, a través de radiografías panorámicas digitales de los maxilares. Se trata de un estudio observacional, transversal y retrospectivo, en el que se analizaron 4.837 radiografías, provenientes de los archivos de un servicio privado de radiología dental en la ciudad de Cabo de Santo Agostinho-PE, Brasil, referido al período 2011-2017. La morfología de la placa ateromatosa calcificada se clasificó en: Grado I - normal (no aparece placa); Grado II: engrosamiento de la íntima; Grado III: placa simple (menos de 5 mm de espesor); Grado IV: placa compleja (más de 5 mm de grosor) y grado V: Irregular o amorfo (placa irregular con proyecciones móviles). Los datos recolectados se expresaron en valores absolutos y frecuencia, analizados mediante el chi-cuadrado, considerando $p < 0,05$. De las radiografías analizadas, 1.321 cumplieron los criterios de elegibilidad, de estas 51 (3,8% presentaron imagen sugerente de placa ateromatosa, 71% eran del sexo femenino ($p = 0,003$), 45% estaban en el rango de edad entre 5 y 6a década de la vida ($p = 0,001$), la mayoría de las placas identificadas eran unilaterales, hacia la izquierda ($p = 0,02$) y el 76% se clasificaron morfológicamente como grado III (menos de 5mm de espesor). verificó la baja prevalencia de imágenes sugerentes de ateromasas en arteria carótida, con mayor ocurrencia en el sexo femenino, entre la 5ª y 6ª década de la vida, unilateralmente, hacia la izquierda y clasificadas morfológicamente en grado III.

Palabras clave: Arterias carótidas; Placa aterosclerótica; Radiografía panorámica; Anatomía; Enfermedades cardiovasculares.
