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PANORAMIC DETECTION FOR DENTAL ANOMALIES OF PATIENTS WITH STROKE

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Abstract

In the panoramic radiographs that were taken of the people who had just been accepted into dental school, calcifications in the region of the carotid vasculature could be identified in 4.5 percent of the 300 patients. This information was gleaned from the examination of the patients' medical histories. The people who had calcifications were questioned by the authors to see whether or not those patients displayed any known risk factors related with atherosclerosis. Obesity and atherosclerosis were shown to have a link in the patients who were questioned, and one of the patients reported experiencing symptoms of atherosclerosis. This relationship was demonstrated to have a statistically significant connection in the patients who were questioned. The authors came to the conclusion that panoramic radiography is helpful in the identification of some asymptomatic individuals who have carotid calcifications. This was one of the conclusions that they reached. After conducting the necessary study, they came to this conclusion. These persons should make an appointment with their primary care physicians as soon as it is humanly possible so that they can have a cerebrovascular workup as part of a preventative approach to lower the likelihood of having a stroke.

Introduction

A cerebrovascular event, more often referred to as a stroke, is the third leading cause of death in the US. This medical condition is known to by its abbreviation, CVA (1). Around 550,000 new cases of stroke are thought to be recorded in the United States each year, and 150,000 of those cases end in fatalities (2). In the United States, there were three million people who had endured a stroke without suffering any negative consequences as of the year 1994. Up to $30 billion will likely be spent annually on these people's care and rehabilitation, according to estimates (3). These results demonstrate how seriously this illness affects everyone's health in the community as a whole. From a financial and humanitarian standpoint, it is crucial to find therapies that have the capacity to lower the rates of stroke-related morbidity and mortality in a manner that is cost-effective (4). The creation of efficient preventative methods and suggestions for the long-term treatment of patients depend on the early identification of those who have a high risk of developing a CVA (5). This is because creating effective preventative programs requires early detection (6). The majority of medical experts believe that the extracranial carotid vasculature's atheromatous plaque is the main factor leading to cerebrovascular embolism and occlusive illness. The extracranial carotid vasculature contains atheromatous plaque, which serves as the foundationfor this notion (5). Dental panoramic radiographs taken as part of normal dental treatment may be utilized to spot certain individuals who are at risk for strokes since this vasculature is located inside the focal trough that is captured by these scans (7). This is due to the fact that the pictures produced by dental panoramic radiography show the vasculature. This is because dental panoramic radiography may yield images in which the vasculature can be viewed. If this diagnosis is made early enough, it may ultimately lead to a thorough evaluation of the patient's cerebrovascular condition and the use of the proper prophylactic treatment (8). Recent research found calcifications at the carotid bifurcation to be associated with military veterans who either had a history of CVA or were at risk of developing the disease in the future. 45 The first persons to describe the presence of calcifications in the carotid vascular region on dental panoramic radiographs were Friedlander and Lande (1). In 1981, they carried out this procedure in around 2% of 1,000 male veterans who attended a dental outpatient clinic (9). The pioneers in this discipline were Friedlander and Lande. Veterans who had previously served in the military services make these patients. Veterans, who had previously participated in the military in some way, were thepatients in question. According to the results of a second study conducted at a different Veterans Administration Medical Center (VAMC), dentistry outpatient clinic, only five men and one woman (3.3 percent of the total) were found to have calcifications in the carotid artery out of a total of 182 participants who were examined (10). Based on research done at a different VAMC's outpatient dental clinic, this conclusion was reached. This indicates a significant decrease in the overall population as compared to the earlier sample size that was examined. 6 Additionally, 37 percent of the 19 white guys who had recently had CVA therapy at a VAMC had their presence of calcified carotid artery plaques confirmed by panoramic radiography (11). All of these guys had received treatments for their CVAs at a VAMC (7). This proportion was determined in order to represent the severity of the problem after the menhad treatment at the VAMC for a CVA. According to the findings of a research including 134 patients with ages ranging from 65 to 88 years old, it was discovered that calcifications of the carotid vasculature were present in 4.5 percent of the elderly population at a VAMC facility. The patients were 65 to 88 yearsold. The majority of the patients had multiple risk indicators in each of these exams, increasing the likelihood that they will have a CVA (12). These risk factors include aging, being a man, hypertension, obesity, using tobacco and alcohol excessively, having hyperlipidemia, and having insulin-dependent diabetic mellitus. Not having diabetes or a history of cardiovascular disease in the family are two additional risk factors. You are more likely to have negative effects if you are a woman or an olderperson. The carotid vasculature's calcified atherosclerotic plaque was shown to be the cause of the calcifications in the carotid artery location (13). These calcium deposits were not typical of any other dystrophic calcium deposits that were found nearby. Imaging tests were used in the exams that led to the discovery. An association between this finding and cervical spine angiography, imaging, or Doppler spectral analysis allowed for the demonstration of this fact (13). Our study's goal was to determine the incidence of carotid vasculature calcifications on panoramic radiographs obtained of randomly chosen outpatients from dental schools and to connect this radiographic evidence with risk factors for thedevelopment of CVA. Unselected outpatients from dental schools were radiographed. We were successfulin achieving both of these objectives over the course of our inquiry, which was our main emphasis.

Material and methods

A screening panoramic radiograph of each of the 300 newly admitted ambulatory outpatients was obtained. In one of the clinics connected to the State University College of Medicine, these people were examined one at a time (with the exception of orthodontics). An Orthophos (S panoramic radiograph machine, which operated at 15 to 16 milliamperes and 64 to 73 kilovolts peak (depending on the size of the patient's jaw), was used to take conventional panoramic radiographs. The patient's oral health was assessed using these variables. These requirements were followed in order to get the panoramic radiographs. For this project, Kodak T-Mat G panoramic film and Kodak Lanex medium screens were used. We used an automated film processor to process the exposed radiographs, and we did so in accordance with the parameters that the film processor's manufacturer had given us. Then, using the transmitted light from a typical viewing box, we looked at the radiographs at a location with less total ambient light. This gave us a clearer view of the radiographs. We used a combination of magnification and a hot spot light to confirm the correctness of potential calcification diagnosis. We were specifically searching for signs of tissue calcification. Each and every one of the radiographs was assessed by the oral and maxillofacial radiologist, who, together with the other authors, annually reviews more than 3,000 panoramic radiographs. In 23 of the cases, the initial radiographs of the patient were assessed to be of inadequate quality due to issues with the patient's location or exposure. The patient was being scanned, which is what caused this. All of the patients gave

their permission to continue participating in the study after the following tests. We were successful in obtaining good radiographs during these testing. Then, weinterviewed patients whose radiographs revealed soft-tissue calcifications in the carotid vascular area, as well as individuals whose ages and sexes were matched within the group and who did not exhibit signs of soft-tissue calcifications. In addition, we spoke with individuals whose radiographs revealed no indication of soft-tissue calcifications. Additionally, we contrasted the results of these interviews with the radiographs of the patients who had soft tissue calcifications. These interviews were conducted with the goal of compiling a list of the key elements of the patients' prior medical histories that were related totheir likelihood of experiencing a stroke in the future. We at State University of New York at Buffalo evaluated risk profiles in accordance with the directives provided by the human subjects review board. Obesity, a self-reported history of smoking, diabetes mellitus, hypertension or hypercholesterolemia, a history of transient ischemic episodes, or a prior coronary heart attack, were the particular risk variables that we examined (CVA). Using x2 tests of association, we looked at the relationship between the specificrisk variables for CVA and the presence of carotid artery calcification on the dental panoramic radiograph. This enabled us to establish if there was a connection between the two. This study was successfully completed in order to determine the significance of this association. By using these several tests and analyzing their findings, we were able to ascertain whether or not there was a link between the two.

Statistics

It was discovered that there is a statistically significant difference between a value of 0.05 and any other value. This conclusion was reached by the researchers. This became clear after looking at the relationship between the two divergent values. We made copies of the panoramic films in every instance where there was radiographic proof of carotid calcification and forwarded these, along with a request for a cerebrovascular assessment, to the patient's primary care physician. When the carotid artery had hardened, this was done in each case. We also made care to provide the patient's medical background in the packet. Every single patient who had carotid artery calcification had this treatment (14).

Results

At the time the research was conducted, the patients whose radiographs were included in this analysis hadan average age of 40.1 years. 300 individuals volunteered their time to take part in this study. In contrast, there was just one male patient (representing 50% of the total) and 150 female patients (50 percent). We found evidence of punctate or verticolinear radiopacities under the angle of the jaw, across from the upperthyroid cartilage boundary, and on the opposite side of the C3 or C4 vertebral bodies. On the oppositeside of the thyroid cartilage, these radiopacities were found. On the opposing side of the thyroid cartilage, these radiopacities were discovered. A prevalence incidence of 3.6 percent was observed in the 42 individuals who had these radiopacities in close proximity to the hyoid bone. They did not entirely pierce the hyoid bone, just as ordinary teeth. Twenty of these 42 patients, or 48%, were male and had a mean ageof 65; the remaining 23 had an average age of 66. The following age categories were used to segment the patients: The patients' ages are distributed as follows: This particular sample included 39 people who were at least 50 years old, which represents 92.8% of the population as a whole. Calcifications were only present on one side in 38.1% of the cases, while they were present on both sides in 61.9% of the cases. These 42 patients included a total of 19 obese individuals, 13 former smokers, 14 hypertensive patients, and 8 people with diabetes mellitus. The one patient who had previously had a CVA was aware of the symptoms related to them. The findings of the X2 tests did not support the hypothesis that smoking, high blood pressure, or insulin-dependent diabetes mellitus are related to carotid artery calcification when a significant level of.05 and one degree of freedom were utilized. This demonstrates that these factors did not contribute to the formation of carotid artery calcification. The following result was achieved thanks to the application of this value. When one degree of freedom and a value of.005 were used in the statistical analysis, it was shown that there was an association between obesity and carotid artery calcification. This correlation was found to be statistically significant. Lack of data prevented the researchers from investigating the relationships between carotid artery calcification and hypercholesterolemia, transient ischemic episodes (TIAs), or past cardiovascular disease (CVD). All fifty patients included in the sample received cerebrovascular evaluations, with the exception of one patient whose attending physician was already aware of the type and severity of the patient's carotid atherosclerosis. The 50 patients that madeup the sample were all evaluated separately. The cerebral vascular systems of those who were still alive were assessed. The noninvasive evaluations concentrated on the middle cerebral artery, which is regarded to be the vessel most vulnerable to emboli from the carotid bifurcation cutting off its blood supply. This isbecause the carotid bifurcation, which is the point at which the carotid artery splits into its two branches,is situated exactly in the midst of the two branches. Doppler ultrasonography and duplex imaging of colorflow in real time were used to examine the carotid artery. The findings of this investigation led to the development of a program for the recall and follow-up of all patients as well as the implementation of changes to patients' lifestyles, such as smoking cessation programs and, in certain instances, pharmaceutical therapy. This investigation also led to the creation of a plan for the recall and follow-up ofall patients. This inquiry also resulted in the creation of a procedure for the recall and subsequent monitoring of all patients. No one in this particular research line had atherosclerotic plaque surgically removed as a preventative intervention due to stenosis. This was the result after looking at each topic. However, some of the patients who are participating in an ongoing study that is extending the research from the study discussed in this article and correlating the level of stenosis found on an ultrasound exam with the presence of carotid calcifications on panoramic radiographs had surgery immediately following their cerebrovascular evaluations. By finding a link between the presence of carotid calcifications and the degree of stenosis found during an ultrasound test, this study is expanding the research from the study mentioned in this article. From the work that was done in the study that was previously presented in this

article, the examination into the association between the existence of carotid calcifications and the degree of stenosis observed on an ultrasound test is ongoing (Figures 1-4).

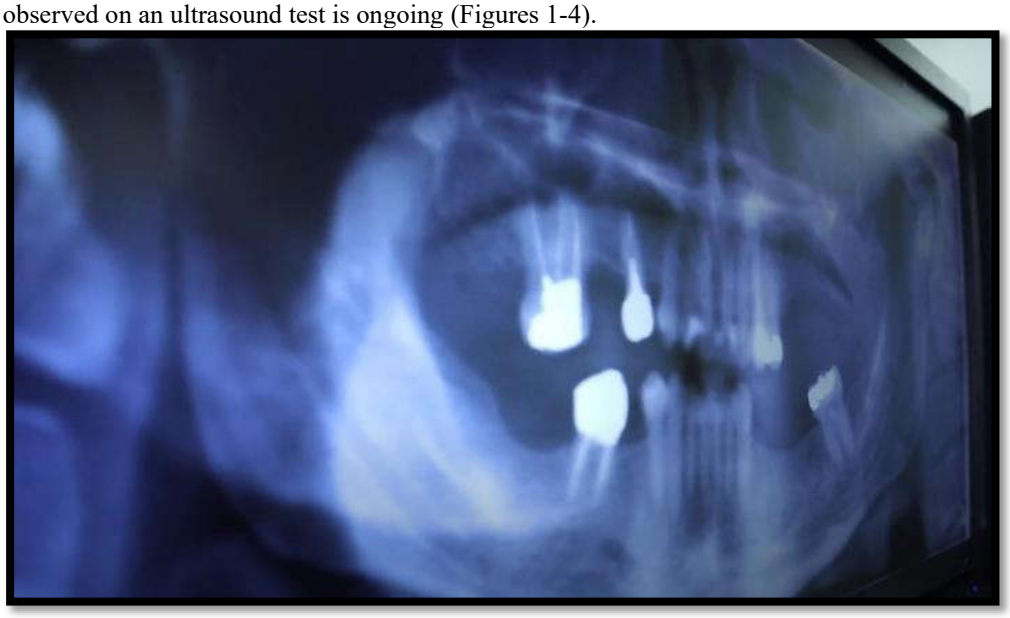


Figure 1. Punctate and verticollnear calcifications (arrowhead) are consistent with carotid vascular calcifications. Tongue base and epiglottis shadows are not continuous with mineralized pathosis.

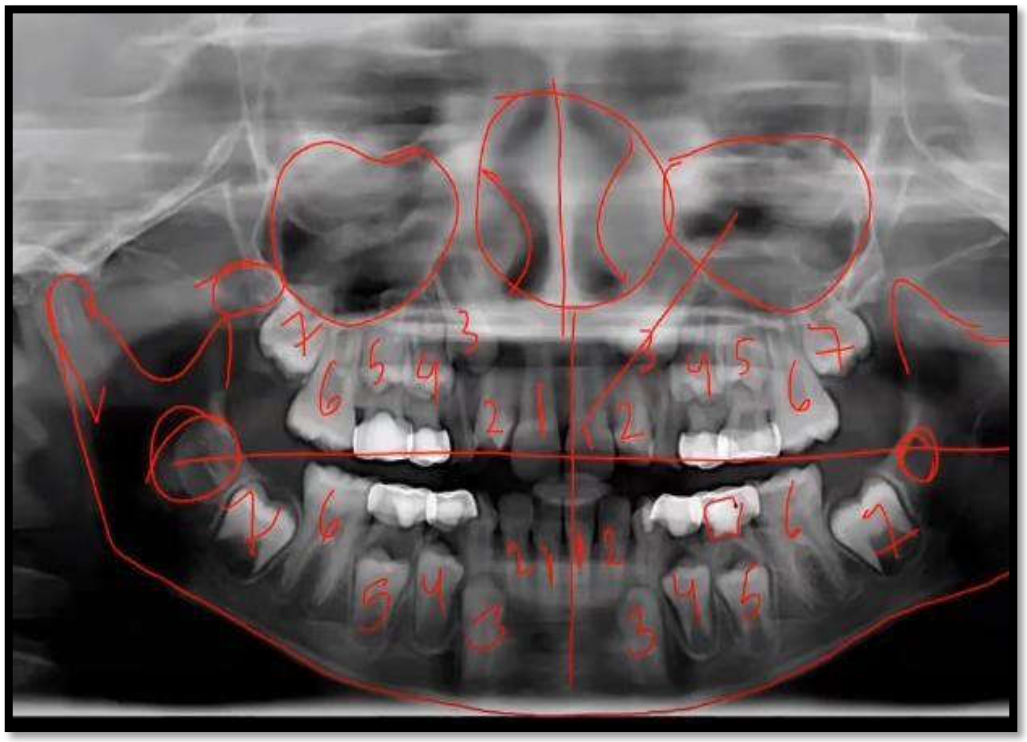
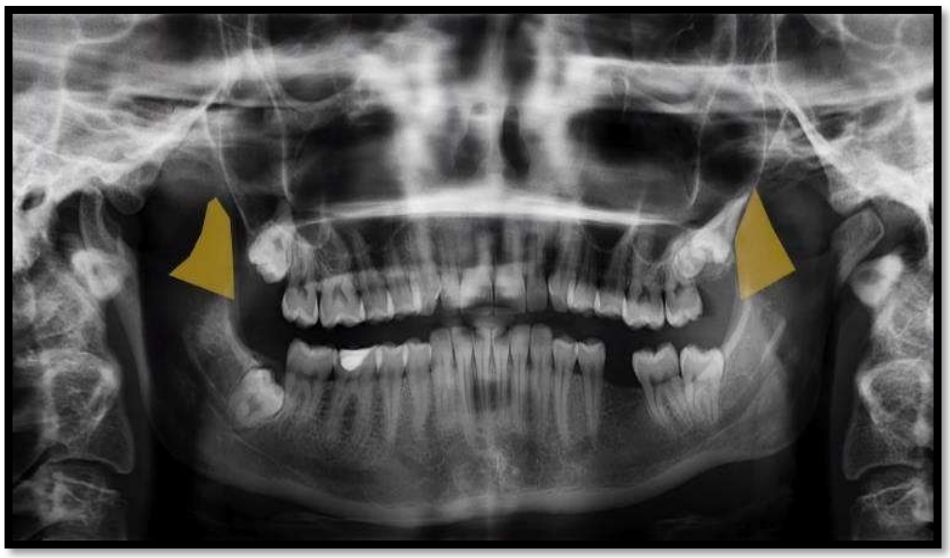


Figure 2. This 70-year-old guy with a history of Tias and coronary bypass has significant carotidcalcification. Due to atherosclerotic plaque, the Left carotid bulb and Intimal carotid artery may be tracked (arrows).

Figure 3. This panoramic radiograph shows uneven cervical soft-tissue calcifications and left- sided carotid calcifications (arrowhead). Physical exam showed no bruits, but ultrasonography showed 30-40% stenosis.

Figure 4. This 65-year-old man's panoramic radiograph shows soft-tissue calcification. Right neck inferior to mandible angle, next to hyoid bone, opposite C3 to C4 (arrowheads).



Discussion

Hemorrhagic and thromboembolic strokes are only two of the many signs and symptoms of this condition. A ruptured blood vessel in the brain may be the cause of hemorrhagic strokes, which make up around 15% of all strokes. This specific kind of stroke is brought on by bleeding into the brain (1). Patients who have intracranial vascular sites and patients who are African-American or Asian in general seem to benefit from this mechanism (1). A thrombus, or clot as it is more often called, is to blame for around 85% of all strokes. Ischemia results from this process distant to the site where the thrombus blocksthe arterial lumen. Extracranial carotid disease is linked to an increased chance of having an ischemic stroke. This link may be shown by correlation (10). Additionally, plaque around the bifurcation of the carotid artery is responsible for 60% of all thromboembolic strokes. An ischemic stroke may cause neurological impairment depending on the location of the injured artery and how long the event lasted. Together, these two factors determine the collateral circulation level, which in turn determines the degree of neurological impairment (5). The middle cerebral artery is regarded to be the vessel most susceptible to blockage by emboli from the carotid bifurcation. This happens because the middle cerebral artery continues directly from the internal carotid artery (15). At a point just across from the superior thyroid cartilage edge, the common carotid artery splits into the internal and external carotid arteries. Blood travels via these two arteries from the heart to the body (16). Damage to the vascular endothelium at the bifurcation starts the earliest stages of the plaque development process. Flow reversals, turbulence, andthe change in shear rate caused by flow separation are the three factors that cause this damage. In contrast to platelet-derived growth factor, which may encourage the formation of smooth muscle cells, serum lipoproteins may pass through damaged endothelium and assemble in the intima of blood arteries. If

thesethicker plaques are not covered with calcium salt, radiographs won't show them (5). The completion ofthis procedure will take some time (7). There are ongoing cycles of plaque breakdown and repair, starting with intraplaque bleeding and concluding with ulceration through the endothelium. The completion of these processes might take a very long period (13). When this occurs, the skin's subcutaneous collagen becomes exposed, ultimately resulting in the growth of a mural thrombus. Because the thrombus blocks the intracranial arteries, some people may get thromboembolic stroke as a result of the embolization. Cerebral ischemia may develop in certain people if the atheroma grows to a size that narrows the artery's lumen, which then lowers blood flow to the distal section of the artery (7). variables that increase the risk of stroke and predictors of stroke A momentary loss of vision on one side of the brain (ipsilateral monocular blindness or visual field deficiency) or a handicap on the other side of the brain may both be signs of a cerebral TIA (contralateral motor dysfunction or sensory deficit) (12). TIAs are prodromal symptoms indicating the onset of a full-blown stroke, even though they may only last a few minutes and leave no long-term indications of neurologic deficiency (8). 25% of individuals get their first episode of cerebral infarction within three years following a transient ischemic incident. Patients who are becoming older, are men, are obese, have hypertension, hypercholesterolemia, elevated blood triglycerides, smoke, or have insulin-dependent diabetes mellitus may be at risk for having CVA (17). High serum triglyceride concentrations are an additional risk factor. This research found that the only factor significantly associated with carotid calcifications on the dental panoramic radiograph was obesity. The connection between the two variables was shown. It's possible that the small number of participants in our sample (n= 42) made it difficult to identify further associations. Obesity may be the risk factor that is most directly linked to the formation of calcifications in the arterial tree, even if the risk variables that were previously discussed may actually be able to predict the development of CVA (1). If this is the case, it may be important to use panoramic radiography to check obese people for these calcifications. Further research should be done on this idea. If this is the case, it may be crucial to screen obese persons for these calcifications using panoramic radiography (13). One last possibility is that obesity may be specifically associated with the development of calcifications in the atrial tree. Another risk factor affects the onset of atherosclerosis and carotid artery calcification (10). A growing body of research shows that increased blood homocysteine levels are associated with a clearly graded increase in the risk of carotid artery stenosis. This evidence has been rapidly accumulating (18). Homocysteine has been shown to be athrombogenic agent, to increase the proliferation of smooth muscle cells, and to have negative effects on the vascular endothelium (12). All of these activities are essential for the onset of atherosclerosis. Hyperhomocysteinemia is associated with carotid artery wall thickening and lumenal stenosis, which are brought on by inadequate consumption of folic acid, vitamin B6, or vitamin B12 (13, 19-21).

CONCLUSIONS

In the VAMC investigation by Friedlander and colleagues, patients were mostly veterans. When the risk variables were included, these groups showed a propensity for the onset of stroke. Our study provides the first evidence of the prevalence of carotid artery calcification in a general outpatient ambulatory dentistry population. This group's carotid vascular calcification incidence, which was higher than anticipated at 3.6percent, revealed a statistically significant connection with obesity when compared to age- and sex- matched controls. Despite the fact that we only found a statistically significant difference in obesity between carotid calcification cases and controls, our study's overall incidence of 3.6 percent is strikingly close to prior work by Friedlander and colleagues in terms of risk factors. Furthermore, because 28% of stroke patients were under 65 at the time of cerebral infarction, the old population cannot be the only one evaluated in the search for stroke risk factors. We come to the conclusion that certain asymptomatic people who haven't yet been diagnosed as having a stroke risk might benefit from having dental panoramic radiography taken of their teeth. As part of an active stroke prevention strategy, a fast and significant referral to the patient's doctor for a cerebrovascular work-up is essential when carotid calcifications are seen on panoramic radiographs. Finding patients who are at risk of having a stroke may be made much easier by analyzing films that were previously taken during routine dental care.

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