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Perio-endodontic Lesions that Require Endodontic Therapy in Alzheimer's Disease Patients

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Abstract

Twenty individuals with Alzheimer's disease who were older than 60 participated in this observational cross-sectional analytical investigation. The study participants were chosen using the purposive sample technique in accordance with preset inclusion and exclusion criteria. Then, using a pretested semi-structured check list, information was gathered through clinical, radiological, dental, and medical history. Digital OPG or radiovisiography (RVG) were used to evaluate perio-endodontic lesions that required endodontic therapy. According to the findings, 15 Alzheimer's patients out of the 21 participants suffered from perio-endo lesions. In conclusion, perio-endodontic lesions that require endodontic therapy are more common in patients with Alzheimer's disease.

Keywords: Alzheimer’s Disease, Perio-endo Lesion, Root Canal Treatment

Introduction

The involvement of both periodontal and pulpal disease in the same tooth has been used to describe periodontal-endodontic lesions. Nowadays, most people agree that bacterial infections are the cause of the great majority of pulpal and periodontal diseases [1]. Because a single lesion may exhibit indications of both endodontic and periodontal involvement, diagnosing perio-endo or endo-perio lesions can be challenging. Furthermore, numerous investigations have shown that infected root canals and advanced periodontitis share important microbiological characteristics, demonstrating the intimate relationship between pulpal and periodontal tissues and the disease transmission between these two disorders. The presence of connection between the pulp and periodontal tissues is also suggested by similarities in the makeup of cellular infiltrates, in addition to these microbial results. These results therefore suggest the possibility of cross-contamination between the pulp and the periodontal tissue [2].

Since 1964, when the link between the tooth's pulp and surrounding periodontium was first defined, the term "endo-perio lesions" has become a staple of the dental lexicon. Regretfully, this word has been used indiscriminately to classify diseases with either an endodontic or periodontal genesis, whether or not the other is subsequent. Although it offers a quick general diagnosis, it may be deceptive for any lesion of this type, regardless of its underlying cause. One of the main difficulties in endodontic therapy with periodontal involvement is furcation involvement.

The high prevalence of molar teeth with accessory canals supports this link, even though the exact function of pulpal pathology in the etiology of furcation involvement is yet unknown. For the sole treatment of perio-endo lesions, a number of treatment techniques have been suggested, such as open flap debridement, root surface bio-modification, and other regenerative procedures including root canal therapy [3].

One of the major socio-health issues facing the developed world, Alzheimer's disease is a neurodegenerative process with a complex and multifactorial etiology linked to numerous risk and protective factors. Its prevalence rises exponentially with age starting at age. According to estimates, there would be 35.6 million dementia sufferers globally in 2010, and by 2050, that number is expected to have doubled every 20 years, reaching over 115 million [4]. The association between Alzheimer's disease and perio-endo lesions demonstrated that, in recent years, there has been a greater scholarly emphasis on the link between systemic disorders and oral health. Recent research has demonstrated a strong correlation between dental health and the consequences of chronic inflammation in systemic disorders, like AD. As indicated by denture hygiene, coronal decaying, missing and filled teeth, filled teeth (cervical), and the percentage of the population with caries, the results of a prior study show significant declines in oral health in people with Alzheimer's disease. The number of coronal surfaces with decay and the number of teeth with decaying and filled roots show notable differences between patients with Alzheimer's disease and healthy people, according to baseline data. The dementia group saw mean yearly increases in coronal caries of 2.29±4.29 per 100 surfaces at risk, which was more than twice as high as the comparison group (0.88±1.14). The dementia group experienced mean annual increments for root caries of 2.38±5.57 per 100 accessible surfaces, while the comparison group experienced mean increases of 0.31± 0.69. The significant statistical difference in caries increments between the two groups in these tiny samples is statistically significant, even with these substantial mean differences [5-7].

Conversely, the inflammatory process in the periodontal region causes connective tissue and bone loss primarily via activating matrix metalloproteinases (MMP) and host-derived osteoclasts. Strong inflammatory cells, including polymorphonuclear leukocytes, monocyte/macrophages, T-cells, and B-cells, have penetrated the connective tissue next to the pocket epithelium. This infiltration is mediated by a variety of cytokines and chemokines, the majority of which are generated by the inflammatory cells themselves. This low-grade inflammation is thought to aggravate other systemic illnesses and disrupt overall systemic health. Thus, it is possible to designate perio-endo lesions as a "low-grade systemic disease [8-10]." According to recent research, periodontal infections may contribute to brain inflammation and the intermittent and delayed development of Alzheimer's disease (Vahabi *et al*., 2018). A considerable amount of bacteria and inflammatory mediators are released into the body by perio-endo lesions, which are infections of certain chronic bacteria that impact the tissues that support teeth, including the gums, periodontal ligament, and alveolar bone. Given the significant roles that inflammation, blood vessel damage, and oxidative stress play in the etiopathogenesis of AD, it is hypothesized that periodontitis may be linked to dementia and cognitive impairment [11, 12].

Additionally, because Alzheimer disease gradually damages the cognitive processes involved in learning, attention, and memory, oral hygiene has drastically decreased in people with the disease. About 5–20% of persons over 60 have periodontitis, which is a common cause of persistent systemic infections. Bacteria and their endotoxins may enter the bloodstream through the non-keratinized periodontal pocket and junctional epithelium. Furthermore, the mechanisms that affect the systemic balance and inflammatory mediators in this local inflammation may be brought on by periodontal infections. The link between periodontal disease and other systemic disorders, including AD, is based on periodontopathic bacteria and the inflammation they create in the body [13, 14].

According to a number of studies, one illness may be the cause or effect of another, and it is also linked to the development of other systemic illnesses, including Alzheimer's disease. Nevertheless, Alzheimer's disease may be linked to periodontitis, which, if left untreated, accelerates the development of perio-endo lesions [15, 16]. Consequently, it is possible that the prevalence of perio-endo lesions requiring endodontic treatment may differ significantly between individuals with and without Alzheimer's disease. To support this claim, a study of perio-endodontic lesions that require endodontic treatment between individuals with and without Alzheimer's disease is required. In order to assess and compare the perio-endodontic lesions that require endodontic treatment across people with and without Alzheimer's disease, an observational cross-sectional analytical study was conducted.

Materials and methods

Over the course of a year (April 2020 to March 2021), this observational cross-sectional analytical study was carried out in the Department of Conservative Dentistry and Endodontics at Bangabandhu Sheikh Mujib Medical University (BSMMU), Neuro-Medicine outside of Bangabandhu Sheikh Mujib Medical University, and National Institute of Neurosciences & Hospital, Dhaka.

Study sample

Twenty-one subjects with Alzheimer's disease who were older than sixty years were used. According to predefined inclusion criteria, the following study subjects were selected using the purposeful sampling technique: Patients aged 60 and over who had AD (group A) and subjects aged 60 and over who did not have AD (group B). Participants were chosen for the study based on their voluntary agreement. Data on a specific patient was documented, including case history, clinical evaluation, and radiological results. The teeth underwent a clinical checkup and vitality test. For the confirmation evaluation test, two types of radiological tests were conducted.

Study Procedure

Perio-endo lesions can be identified using a variety of diagnostic techniques. We can examine a number of factors to determine the type of lesion and possibly its origin. When attempting to make a diagnosis, we want to look at the following: Mobility, swelling, periodontal involvement: Pockets, pain, pulp vitality, and history. As a precaution, a radiograph was done. Before a radiograph was taken, each patient's intraoral digital sensor was covered with a disposable covering. All participants wore lead aprons to reduce the radiation from dental radiographs. The assessment that was conducted was as follows:

(1) If any caries or restorations were found, their true depth and relationship to the pulpal space were noted; (2) if radiolucency was found, its relationship to the tooth's apex and root canal was noted; (3) if bone loss was found, its location (crest or toward the apex) was noted; and (4) if any

other related pathology or abnormality was found, it was noted.

Radiovisiography for perio-endo lesion identification

To take periapical x-rays using RadioVisiography in parallax view technique, each patient was taken to the radiograph room. The patient was x-rayed using the NOMAD Pro 2 System radiograph equipment. The NOMAD Pro 2 System was used to take periapical radiographs (RVGs) using exposure parameters of 60Kv, 2.5Ma, and 0.16 seconds. Two preoperative radiographs were acquired in order to better visualize the labio-lingual anatomy: One at a mesial angle of around 200 and another with a 900 angulation to the tooth in the labio-lingual direction. The desktop computer running the RVG software (Gendex) was used to analyze the RVG images.

Identification of perio-endo lesions by Digital OPG

Digital OPG was performed on the chosen patient. Digital radiography is a type of X-ray imaging in which conventional photographic film is substituted with digital dental X-ray sensors. Benefits include the ability to digitally upload and enhance photographs and time savings by avoiding chemical processing. Additionally, compared to traditional radiography, less radiation is used to create an image with comparable contrast. Digital dental X-ray radiography uses a digital image capture system instead of X-ray film, thus the results are available to the dentist practically instantly. In the past, the dentist had to wait for the film to be processed.

Dental radiological tests fall into two categories: Extraoral, in which the sensor is positioned outside the mouth with the goal of visualizing the entire oral maxillofacial region, and intraoral, in which the sensor is placed inside the mouth with the intention of focusing on a limited area. A panoramic or wide view X-ray of the lower face that shows every tooth in the upper and lower jaw on a single film is called an OPG X-ray.

Statistical analysis

A pre-made data collecting form that the researcher fills out during the interview and is supported by documentation of the clinical examination, RVG, and OPG. The Statistical Package for Social Sciences (SPSS) program (version 24) for Windows was then used to examine them. Descriptive analysis (cross tabulation) was used to evaluate the data, and the results were displayed in frequency and percentages for both groups along with the p-value. The Pearson chi-square test was performed to evaluate the frequency of perio-endo lesions between patients with Alzheimer's disease and people without the disease; a p value of less than 0.05 is deemed statistically significant.

Results

Of the forty-two study participants chosen, twenty-one (50%) had Alzheimer's disease and twenty-one (50%) did not. The study parameters were endodontic therapy and perio-endo lesions. It was discovered that 15 patients with Alzheimer's disease suffered from perio-endo lesions. However, only five participants who did not have Alzheimer's disease had issues with perio-endo lesions. There was a statistically significant difference (p-value =.002) in the number of perio-endo lesions that required endodontic treatment between the participants with and without Alzheimer's disease.

Discussion

It is evident from the above-mentioned study results that patient with Alzheimer's disease have a higher prevalence of perio-endo lesions than subjects without the condition. In order to encourage patients with Alzheimer's disease to avoid pulpitis and periodontitis, the current study compared and evaluated the prevalence of perio-endodontic lesion disease in need of endodontic treatment between subjects without the disease and patients with Alzheimer's disease. Additionally, it is anticipated that this study will contribute to the development of guidelines regarding the routine oral hygiene practices of people with Alzheimer's disease. Furthermore, perio-endo lesions and endodontic treatment were the study's characteristics. The current study shows that 71% of Alzheimer's disease patients suffered from perio-endo lesions. However, only 23% of participants without Alzheimer's disease had issues with perio-endo lesions, and there were statistically significant differences in perio-endo lesions between the groups with and without Alzheimer's disease.

In 2014, Pardo and Barrios studied the connection between dementia and periodontitis in Spain. They discovered that, generally speaking, the patients' oral health condition was poorer than the controls' (healthy people's). Compared to the control group, the cognitively impaired patients had fewer teeth and poorer dental hygiene. With notable variations from controls, 10% of cases had no or just mild periodontal disease, 21.7% had moderate periodontitis, and 68.3% had severe periodontitis. Attachment loss, pocket depth, and bleeding on probing were all substantially linked to AD patients. The findings of our current investigation are comparable to those of this study. A 2010 study by Kaye *et al*. in the UK [17, 18] found that periodontal disease and tooth loss are predictive of impaired cognitive performance in older males. Their research shown that rates of tooth loss and the advancement of periodontal disease predicted a subsequent deterioration in cognitive function in males living in the community. These results imply that peripheral inflammation has a role in the development of dementia and cognitive impairment and support the idea that dental health is a significant modifiable factor of cognitive function. The results of our current investigation also show similarities to previous study.

Regarding dental health care for individuals with Alzheimer's disease, our study also produced findings that were comparable to those of a prior study done in 2019 by Marchini *et al*. [19]. They show that because dementia patients need full-time, intense care for several years, Alzheimer's disease and related disorders (ADRD) are one of the age-associated chronic illnesses that pose the greatest challenges to health care systems worldwide. People with AD frequently have poor dental health because cognitive decline has a detrimental impact on oral health care. Poor oral health is associated with numerous negative effects on AD patients' well-being [20, 21].

Along with current research and future directions for improving oral health care for patients with Alzheimer's disease, this study also provides an update on the most recent concepts regarding the prevalence of perio-endo lesions with Alzheimer's disease, which will help to provide oral health promotion strategies for this population. Additionally, this study suggests that in order to prevent

rapid oral health deterioration, oral health treatment should be incorporated into the patient's routine medical care as early as feasible in the course of Alzheimer's disease. Achieving good oral health outcomes and preventing a loss in quality of life requires establishing oral hygiene routines and offering dental treatment tailored to each patient's needs and disease stage [22, 23].

Apical periodontal or pulpal disease is the cause of the great majority of perio-endo lesions. Tooth disease can spread to neighboring tissues and cause a marked rise in patient morbidity if discovered in an advanced stage or if treatment is not received. Not all lucencies around the tooth root are caused by infection, even though the majority of perio-endo lesions appear on radiographs and computed tomographic images as a result of apical periodontal or pulpal illness. In the context of other odontogenic and non-odontogenic disorders, lucency may be observed close to the tooth root [24]. Furthermore, because periodontal tissues and dental pulp are closely related, diagnosing and treating periodontal-endodontic diseases can be challenging. Bidirectional transmission of infection and/or inflammation is made possible via communications between the two biological entities, which can take place through the apical foramen, accessory canals, or exposed dentinal tubules. It is possible for endodontic and periodontal lesions to appear separately. Additionally, diseased pulps can cause tissue death and an inflammatory reaction in nearby periodontal tissues. Similarly, periodontal infections can cause progressive pulpal pathoses. Conversely, pulpal or periodontal tissues may experience pain that is identical, particularly in mixed lesions where endodontic and periodontal infections coexist. Signs and symptoms like pain, tooth movement, deeper probing pockets, and localized edema may appear simultaneously when multiple lesions form. Therefore, to distinguish between periodontal, endodontic, and combination diseases and to make the right diagnosis, the right diagnostic tests and a thorough clinical examination are needed. For any periodontal or endodontic lesion, a proper diagnosis and prompt use of the right therapies are essential to successful treatment outcomes [25, 26].

Alzheimer's disease, on the other hand, is a cognitive illness that impairs judgment and decision-making and has irreversible symptoms. The current data supports the notion that periodontal pathogens are potential causes of neuronal inflammation and the development of Alzheimer's disease. The primary mechanism of the disease is inflammation in the brain, which most likely has a complex interaction with the environment, etiology, and genetics. Chronic systemic infections are frequently caused by perio-endo, and illnesses or diseases can serve as a pathway for bacteria to enter the bloodstream. The systemic inflammation brought on by perioendopathic bacteria serves as a link between these illnesses and Alzheimer's [27].

In addition to preventing unnecessary extra imaging or intervention, early detection of perio-endo lesions leads to proper referral and fast diagnosis, management, and therapy. Additionally, better clinical results and a reduction in morbidity and mortality will come from early detection and prompt treatment of infectious processes.

Conclusion

According to this study, perio-endo lesions requiring endodontic treatment are statistically significantly more common in individuals with Alzheimer's disease than in those without the condition. Thus, the current investigation came to the conclusion that the hypothesis was supported by rather consistent evidence.

Conflict of interest

Authors declare no conflict of interest.

Ethical Consideration

This study was performed after taking permission from Institutional Review Board (IRB) of Bangabandhu Sheikh Mujib Medical University, Shahbag, Dhaka.

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