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Periapical status and prevalence of endodontic treatment in elderly population

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Abstract
Aim: The aim of this study was to determine the prevalence and frequency of apical periodontitis and root fillings in 450 institutionalized Indian elderly population.
Methodology and Results: The teeth with apical periodontitis were assessed using the Periapical Index (PAI) score. A total of 942 teeth were evaluated in 98 subjects (57 females and 41 males) with mean age of 74 years. The observed frequency of total edentulous subjects was high (76%) in this population. A total of 126 teeth showed root fillings, of these only 46 (36.5%) were scored as having adequate quality. Apical periodontitis was found in 114 teeth (12.1%) in 42 (42.9%) subjects. 80 (70.2%) inadequate root-filled teeth showed apical periodontitis. There was a significant correlation between the presence of periapical pathology and inadequate root-filled teeth. Inadequate root-filled teeth were associated with an increased prevalence of apical periodontitis in these subjects. This fact may result in increased endodontic retreatment needs for this population.
Conclusion: In conclusion, based on the data of the present study, inadequate root filling was associated with an increased prevalence of AP in the institutionalized elderly population. This fact may result in a greater demand for endodontic treatment in this population.

Keywords: apical periodontitis, elderly, endodontics, radiology

Introduction

The increase in the longevity of the world population and the success of preventive dentistry will lead to a growth of the expectation of maintenance of dentition in the elderly patients [1]. This fact may result in an increase of the endodontic treatment needs in this population [2]. Apical periodontitis (AP) is primarily a sequela to dental caries caused by infection of the root canal system [3]. The aim of endodontic epidemiological survey has been described as gaining knowledge of the prevalence of AP and its determinants including treatment outcome in different populations evaluated by presence or absence of AP. Little epidemiological data on the endodontic and periapical status of the elderly have been gathered. These endodontic parameters are important to predict tooth survival and the future need for dental treatment [4]. Specifically in India, an analysis of the endodontic treatment needs in elderly population is not available to date. Tooth loss is highly prevalent in the elderly population. In a previous study, edentulousness was observed in 74.9% of institutionalized Brazilian elderly [5].

Outcomes from cross-sectional epidemiological surveys showed evidences that older subjects have a lower number of remaining teeth and higher ratio of root-filled teeth (RFT) and AP in their teeth compared with younger adults [4]. Longitudinal studies also confirmed these results demonstrated that, on average, the number of teeth decreased with age, but the number of RFT increased in studied elderly populations [6, 7]. However, contrary to these cross-sectional and longitudinal studies, other longitudinal study in elderly women with follow-up of 24 years showed that the prevalence of AP did not increase with age, probably as a result of root canal treatment and extractions. This study also showed that the frequency of RFT and teeth with AP decreased over time for comparable age groups [8].

In different populations, several epidemiological studies have reported the frequency of AP to range from 1.4% [9] to 8.0% [2], using the tooth as a unit. However, when subjects are used as the unit, the prevalence of AP can be as high as 70%, and it increases with age [9]. High frequency of lesions associated with RFT has also been found, especially those related with inadequate endodontic treatments [2].

Considering the importance of epidemiological investigations, the aim of this study was to determine both prevalence and frequency of AP and RFT in the institutionalized elderly population.

Material and Methods

This cross-sectional study was approved by the institutional Ethics Committee. The sample was selected from a population of 450 subjects living in two similar long-permanence institutions (LPI) for elderly people (community-dwelling elderly persons) in India. Two institutions were selected; The convenience sample was selected according to the following inclusions criteria: subjects aged above 60 years, functionally independent or partly dependent, showed no cognitive or systemic deficiency that could difficult the trial, with a minimum of 3 remaining teeth (excluding third molars), and that fill out the written informed consent. Elderly patients having less than 3 remaining teeth were excluded based on the mean of teeth present in institutionalized elderly found in previous study [10]. The subjects were classified according to gender (male or female) and age (60-64; 65-74; 75-79; 80-84; 85-90; >90 years old).

All participants underwent a periapical radiographic survey

in their present teeth. Care to biosafety was maintained during the survey. The radiographs were taken with X-ray unit. The following data were recorded on a structured form for each subject: a) number of teeth present; b) number and location of teeth without root fillings (untreated teeth) having identifiable periapical lesions; c) number and location of RFT; d) number and location of RFT with identifiable periapical lesions. Teeth were classified as RFT if their canals had been filled with a radiopaque material. Tooth filling quality was assessed according to the following criteria [11]: a) satisfactory length/extension of root filling: filling material present in the root canal within 0-2 mm of the radiographic apex; b) unsatisfactory length/extension of root filling: filling material in the root canals more than 2 mm from the radiographic apex, extruded beyond the apical foramen, or present only in the pulp chamber.

The periapical status was assessed using the periapical index (PAI) score. Each score used in the PAI represents a step on an ordinal scale of registration of periapical inflammation: 1=normal periapical structures; 2=small changes in bone structure; 3=changes in bone structure with some mineral loss; 4=periodontitis with well-defined radiolucent area; 5=severe periodontitis with exacerbating features. The periapical status of all teeth was assessed. The worst score of all roots were taken to represent the PAI score for multi-rooted teeth. PAI score greater than 2 (PAI ≥ 3) was considered to be a sign of AP [12].

The radiographic film was assessed by one calibrated examiner in a darkened room, using an illuminated viewer box with 3.5× magnification while mounted in a cardboard slit to block off ambient light emanating from the viewer. The calibration process consisted of theory knowledge about PAI system, interpreting 100 radiographic images of teeth, some root filled and some not, during 4 sessions, totalizing 16 h. After scoring the teeth, the results were compared with a "gold standard atlas" [12]. The Cohen´s Kappa test was used to determine the intraexaminer agreement. Intraexaminer agreement was evaluated by the repeat scoring of 40 randomly selected patients 2 months after the first examination. This intraexaminer agreement test produced a Cohen`s k of 0.79 (substantial agreement).

Raw data were entered into ExcelTM (Microsoft Corporation, Redmond, WA, USA). The analyses were carried out using SAS software (SAS Institute Inc, Cary, NC, USA). The frequency of RFT was calculated, and the periapical status on all teeth and on the treated teeth was assessed. Chi-square and independent t-tests (α=5%) were used to examine associations between both prevalence and frequency of AP in RFT and root filling pattern.

Results

The study population of 450 elderly showed 76% of edentulous (n=342) and 24% of dentate (n=108) subjects. From this last group, 106 persons were located showing the criteria of inclusion for this study. During the development of the survey, 8 persons were excluded for getting sick, unable or have died. The selected sample was composed by 98 old people, both genders (57 females; 41 males), with mean aging of 74 years (ranging to 60-94 years). No statistically significant differences were observed (unpaired t-test, p=0.9095) between the mean age of women (78.0±7.9 years) and men (77.8±7.1 years). The predominance of the female gender was superposed to the male gender. The largest concentration of people by age group was between 75-84 years of age (48%), but there were no statistically significant differences when compared with the group of 65-74 years of age (Table 1).

Excluding the third molars, there were 1,326 lost teeth, representing 48.3% of total possible teeth. The mean number of the teeth per subject was 11.6. Of the 98 participating subjects, 48 (49.0%) had at least one endodontically treated tooth. The periapical status of 942 teeth was evaluated. The mean number of periapical radiographs per person was 5.2 (range 3 to 14). There were 126 teeth (13.4%) with filling material in the root canals, indicating previous endodontic treatment. Of these, only 46 (36.5%) were scored as adequate quality. AP was found in 114 teeth (12.1%) in 42 (42.9%) subjects. Of these, AP was diagnosed in 80 (70.2%) inadequate RFT. There was a significant correlation between the presence of periapical pathology and inadequate root fillings ($p<0.05$). AP was also diagnosed in 32 teeth (28.0%) without root filling, showing no significant statistical correlation (Table 2). No significant differences between males and females were found for presence of AP, RFT and RFT with AP ($p>0.05$). The prevalence of AP between the age groups showed no statistically significant differences ($p>0.05$). The frequency of AP and RFT with AP did not vary significantly with age ($p>0.05$), but the 65-74 and 75-84-year-old groups had the highest frequencies.

Table 1: Characteristics of the sample

Variable	n	%
Institution		
A	74	75.5
B	24	24.5
Gender		
Female	57	58
Male	41	42
Age group (Years)		
60-64	6	6.1
65-74	36	36.8
75-84	47	48.0
85-90	7	7.1
>90	2	2.0
Total	98	100

Table 2: Prevalence and frequency of apical periodontitis (AP) related to the quality of root filling in elderly population

Variable	Apical Periodontitis (%)	No apical periodontitis (%)	Total (%)
Prevalence of apical periodontitis			
Subjects	42(42.9)	56(57.1)	98(100)
Teeth	114(12.1)	828(87.9)	942(100)
Frequency of apical periodontitis			
Untreated	32(28.0)	784(94.7)	816(86.6)
Adequate	2(1.8)	44(5.3)	46(4.9)
Inadequate	80(70.2)	0(0.0)	80(8.5)
p value	0.001		

Discussion

This present cross-sectional study was the only one that used a sample of study including exclusively elderly patients to date. Studies with samples not exclusive but containing elderly patients showed data generalized to other groups of people with lower age range, making it difficult to compare the results. This fact highlights the importance of this present study and the need for further studies with

similar specific samples of populations of elderly people in other regions and countries.

The studied subjects were elderly patients living in two large LPI for elderly people. Although following established inclusion criteria, this sample represented a convenience sample. Clearly, the sample of the present study does not represent a random sample of the elderly Brazilian population, and extrapolation of the results to the elderly population must be carried out with caution. However, the cohort reflected the characteristics of the current Brazilian dentate elderly population and there was no skewed recruitment from a socioeconomic perspective due to the inclusion of subjects from various socioeconomic classes (inclusion criteria for dwelling in the studied LPI). The lack of preventive and educational actions in the past makes the current elderly population show low prevalence of present teeth in the oral cavity. This fact could be observed in other elderly populations around the world, which showed the number of teeth decreased with age [7, 8]. Of total possible teeth found in the present sample, 48.3% (n=1,326) were lost. The mean number of teeth per subject was 11.6, which is similar to other Brazilian study using institutionalized elderly sample [5]. Thus, the results of this study may provide useful data to assess trends concerning the prevalence of AP and endodontic treatment in elderly population.

Another limitation of this and other studies using similar methodology is that the evaluations were limited to radiographs, and no information about the time elapsed since endodontic treatment was available. It is commonly known that apical lesions limited to the cancellous bone usually pass undetected by conventional radiographic techniques. Moreover, the microbiologic conditions of the root canal and apex cannot be inferred on the basis of radiographic examinations alone [4]. Another fact related to the time is relative to the type of epidemiologic study used in this present study. Cross-sectional studies do not include a time dimension. Consequently, results from these studies should not be misinterpreted as being absolute measures of treatment success or failure. Cross-sectional studies describe exposure (study variable of interest) and disease status at the time of the investigation. It is not possible in this type of study to decide whether the exposure preceded the disease or the disease preceded the exposure [3, 4].

Outcomes from longitudinal studies demonstrated the increase of the prevalence of RFT, AP and RFT with AP over the time [9, 13]. However, a longitudinal study showed stabilization of the prevalence ratios of AP over an observation period of 5-10 years. It is tempting to suggest that one of the essential explanations for this fact may be that teeth with AP were more likely to be extracted in the past than today [14]. A study assessing clinical decision-making demonstrated that few general practitioners decided to perform retreatment of RFT with a relatively small but clearly visible lesion, even though it was not expected to heal, whereas specialists in Endodontics were more willing to perform retreatment if an AP lesion persisted [15]. Both the lower proportion of extracted teeth and the tendency among practitioners to “wait and see” could result in more teeth presenting with signs of AP. This fact could be more evident in elderly patients, although these patients showed a history of tooth loss rates higher than adults and young patients, affecting the comparison between groups [13].

Age-related changes of the dental pulp complex and their relationship to systemic aging were well described, influencing the endodontic treatment in elderly patients [4]. This fact together with the other changes and systemic diseases observed in the elderly intended that these subjects could be considered as patients who require special care.

The constant growing of the elderly population will certainly absorb more of the working capacity of the dental profession than we are currently willing to believe. With increased life expectancy and consequent longevity of the world population, more people will live longer and with more teeth in the oral cavity. Thus, the demand for dental treatment of elderly patients will probably increase. General practitioners as well as endodontists will need an expanded knowledge of the needs and the techniques for care of elderly patients. These facts collaborated with the implementation of actions and public policies for the prevention of oral diseases in the elderly population, aiming at the maintenance of their oral health and teeth.

Conclusion

In conclusion, based on the data of the present study, inadequate root filling was associated with an increased prevalence of AP in the institutionalized elderly population. This fact may result in a greater demand for endodontic treatment in this population.

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