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Prevalence of Accessory Canals in Mandibular Molars in Patients Visiting Private Dental College

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KEYWORDS

Cone beam computed tomography, mandibular molar, accessory canal, root canal treatment.

ABSTRACT

OBJECTIVE: The main aim of our study is to check for prevalence for accessory canals in CBCT in order to prevent any postoperative complications of missing a canal from obturation.

MATERIALS AND METHODS: The study was conducted in the Oral medicine and Radiology department which included patients of age group 20-60 years and above. Subjects were assessed radiographically. Patients advised for CBCT and included in the study. The radiographs were evaluated for any accessory canal in the mandibular molars. The results obtained were tabulated to Microsoft Excel Sheet. It was then imported to SPSS software version 23.0.

RESULTS: Among 45 males and 45 females, only 10% of males and 14.4% of females had accessory canal in their mandibular molar.

DISCUSSION AND CONCLUSION: We can conclude that only 24.4% of the patients had accessory canal in their mandibular molar when assessed in CBCT. The presence of accessory canals is important for an endodontist and is challenging for root canal treatments. Hence the radiological finding of an accessory canal plays a major role in the prognosis of root canal therapy.

INTRODUCTION

To root canal therapy to be successful it requires a fundamental understanding of both root canal and its morphology (1). This knowledge covers any abnormalities present in the anatomy of the root canal system encountered in the day to day practice, as well as pre- and intraoperative awareness of markers associated with the normal morphology of the root canal. The likelihood of therapeutic success would rise if both the exterior and internal anatomical aspects of the root were well understood. This would reduce the frequency of missing either a root and root canal during endodontic treatment (2). Comprehensive understanding of both roots Any branch of the main pulp chamber or canal that connects to the root's surface is considered an auxiliary canal (3). A lateral canal is an ancillary channel that often extends horizontally from the primary root canal and which is located either in the coronal or middle third of the root. Your dentist will handle an auxiliary canal in the same manner as the main canal if one is found (4). In order to prevent re-infection, your dentist will debride the affected tissue, shape the canal, and place a filler (5).

It is critical for the doctor to be able to recognize the symptoms that signal auxiliary canals exist in the maxillary central incisors (6). Failure to do so could result in an endodontic treatment outcome that is less than ideal. The most common accessory root/root canal aberrations are those resulting from dens invaginates and palato-gingival groove anomalies in maxillary incisor teeth (7). A complex anatomy of the root canals, including accessory or lateral canals, may have gone unnoticed during the first surgery. Root canals, which include the blood vessels, nerves, and connective tissues that make up the pulp of a tooth, can be very complex (8). In the first molars, 48.2% of mesiobuccal (MB) roots had Vertucci Type IV architecture, 14.2% of teeth had three canals, and 85.8% of teeth had four canals (9). Both the distobuccal and palatal roots have Vertucci Type I

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roots. In 33.6% and 66.4% of the second molars, respectively, there were three and four canals. The surfaces of permanent mandibular first molars are rather wavy and they emerge extremely early. Since they are more likely to develop caries, they are among the teeth that most frequently need endodontic therapy (10). Understanding their anatomical characteristics is therefore even more important. These teeth typically have 3 canals inside 2 roots, but there can be variations based on race and individual differences.

A variant of conventional computed tomography (CT) systems are cone-beam computed tomography (CBCT) systems. Dentists use CBCT machines that revolve around the patient and a cone-shaped X-ray beam to collect data (11). Using these data, a three-dimensional (3D) image of the patient's dental (teeth), oral and maxillofacial area (mouth, jaw, and neck), and ears, nose, and throat ("ENT") anatomy is recreated (12). Since the early 2000s, dental CBCT systems are usually sold in the US. Radiologists and dental professionals are increasingly using them for a variety of clinical purposes, such as planning dental implants, identifying abnormal teeth, assessing cleft palates, evaluating the jaws and face, diagnosing dental caries (cavities), diagnosing endodontic (root canal) issues, and identifying dental trauma (13). In order to improve diagnostic value and avoid root canal treatment failure due to accessory canals being missed, the primary goal of the current study is to examine the prevalence of accessory canals in the mandibular molars using cone beam computed tomography (14).

MATERIALS AND METHODS

Study setting:

The study involved patients reported to Saveetha Dental College and Hospitals OPD, Oral Medicine and Radiology Department. A total of 90 patients were involved in the study. Patients selected belonged to 20-60 years and above age group. They were categorized into 3 groups as Group 1:20-40 years, Group 2:41-60 years and Group 3: 61 years and above. In each group 30 subjects were evaluated radiographically. Patients who had undergone Cone-beam computed tomography for endodontic or any other treatments were identified. Then the radiographs were evaluated for any accessory canals that had to be obturated.

Inclusion criteria:

1. Patients above 20 years of age
2. Patients who were advised for CBCT during their visit to the dental hospital

Exclusion criteria:

1. Tooth which can be assessed with intraoral periapical radiograph.
2. Patients without symptomatic apical periodontitis.
3. Patients with history of trauma or any pathologies in CBCTs.

Images were obtained using Carestream, CS 3D 9600 CBCT unit with an exposure parameter of 70kVp, and 4MA. Patients who had undergone CBCT for endodontic or implantology procedures were considered. Both single arch and both arch CBCT with field of view extending from 4x4 to 8x8 were included in the study. The CBCTs were analyzed retrospectively.

Statistical analysis:

The data collected was tabulated to Microsoft Excel Sheet. It was then imported to SPSS software version 23.0. Chi square test was done to assess the association between variables.

RESULTS

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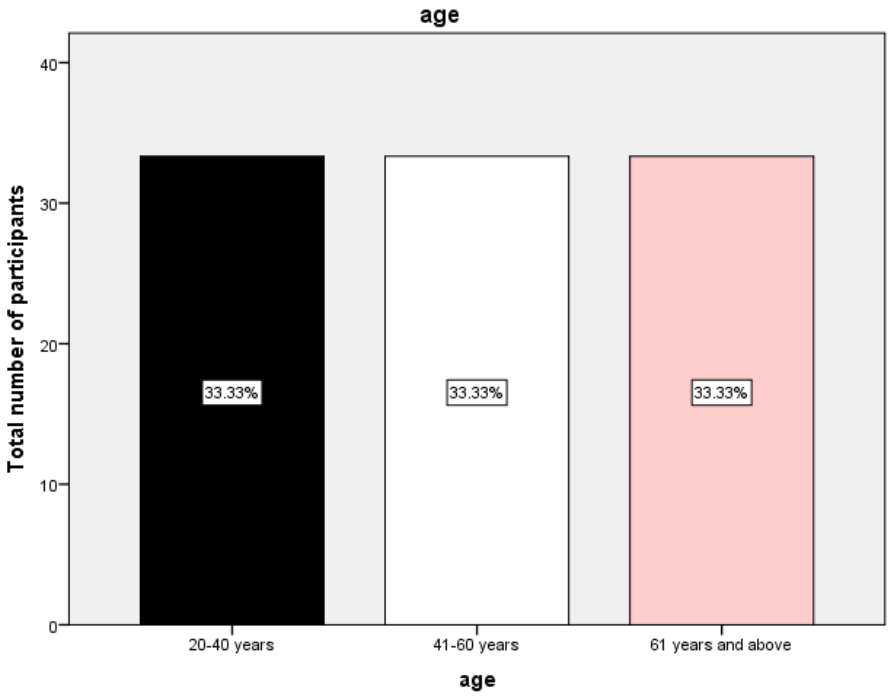

Figure:1: Graph representing the age of the patients involved in this study. Black represents age group of 20-40 years, white is 41-60 years and pink is 61 years and above. X- axis indicates the age of the patients and Y-axis indicates the total number of participants.

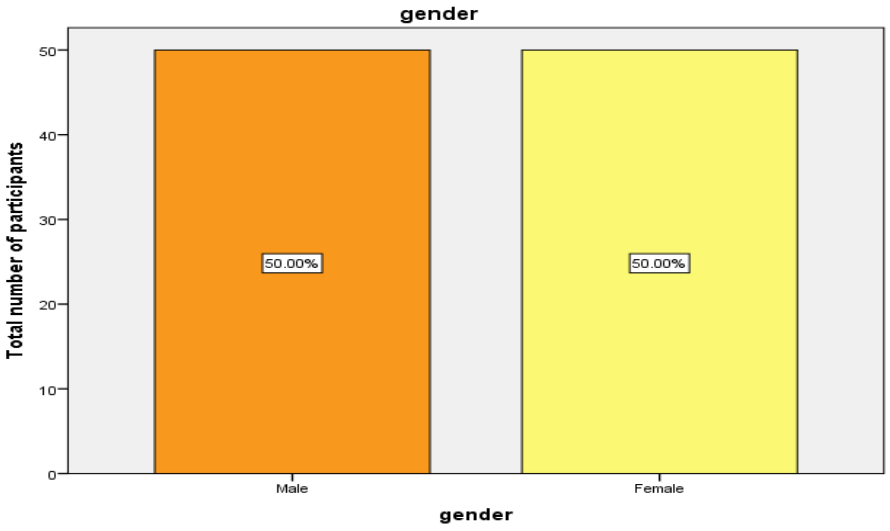

Figure:2: Graph representing the gender of the patients involved in this study. Orange represents 'Male' and yellow is 'Female'. X- axis indicates the gender of the patients and Y-axis indicates the total number of participants.

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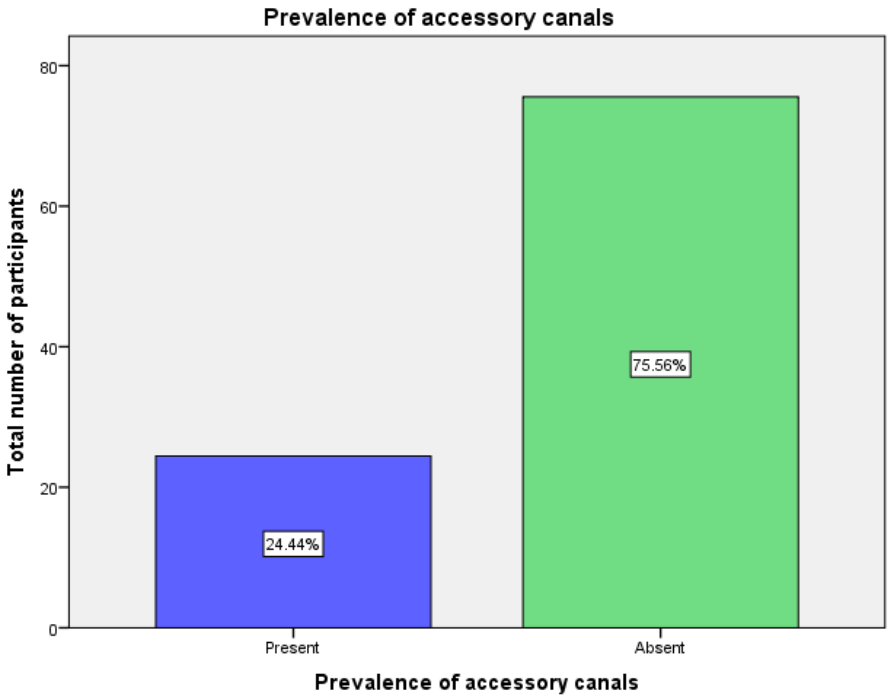

Figure:3: Graph representing the prevalence of accessory canals in mandibular molars in patients involved in this study. X- axis indicates the presence of accessory canals in the patients and Y-axis indicates the total number of participants.

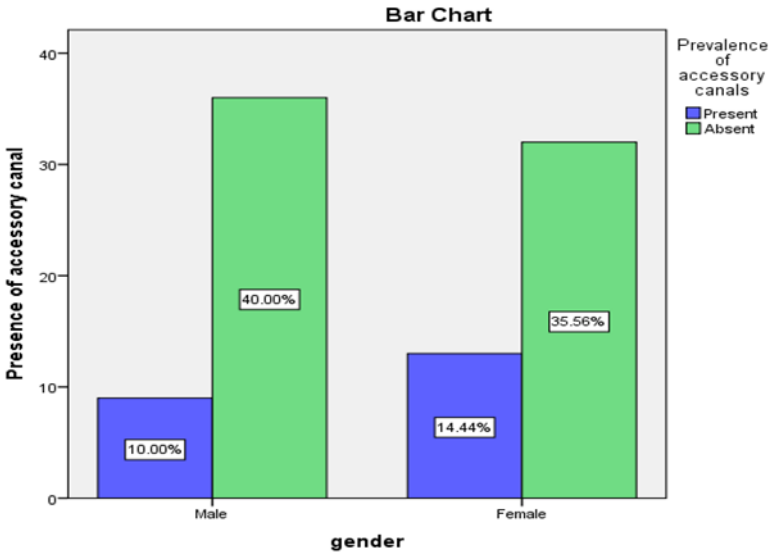

Figure:4: The above graph represents the association between gender and presence of accessory canal. Blue is 'present' and green is 'absent'. 10% of the males and 14.4% of females had accessory canals in the mandibular molar whereas 40% of males and 35.5% of females didn't have any accessory canals in their mandibular molars.

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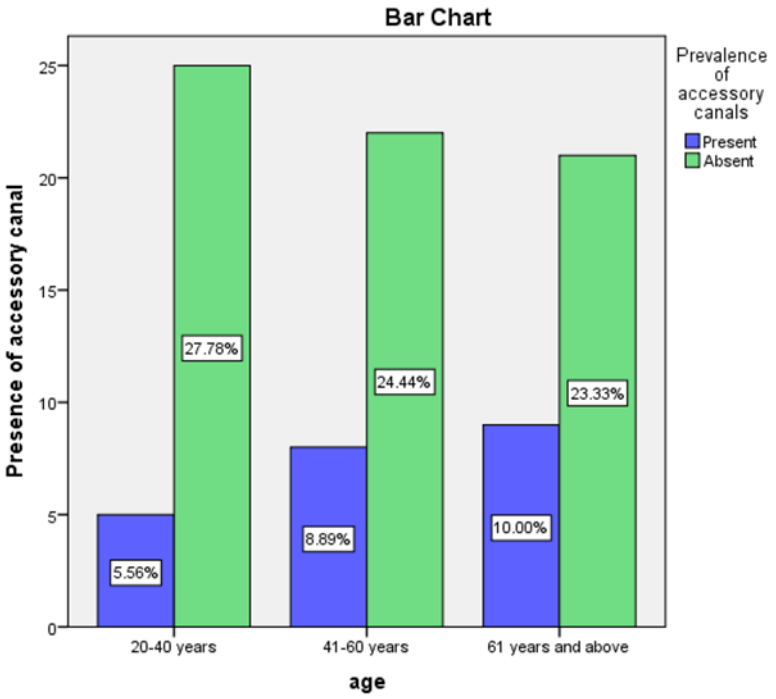

Figure:5: The above graph represents the association between age and presence of accessory canal. Blue is 'present' and green is 'absent'. 5.5% of the patient in age group of 20-40 years, 8.8% of 41-60 years and 10% of 61 years and above had accessory canals and 27.7% of the patient in age group of 20-40 years, 24.4% of 41-60 years and 23.3% of 61 years and above had accessory canals

DISCUSSION

The findings of this study are informative regarding the importance of clinicians throughout the world understanding anatomical variations (13). It is imperative to make an accurate diagnosis of anatomical variations, such as accessory roots or the presence of additional canals, in order to guide clinicians in modifying some endodontic techniques to avoid procedural errors. This can ultimately improve the success and prognosis of root canal treatment (14).

Among the available methods, CBCT has proven its role in detecting morphological variations of tooth structure in an acceptable cost and radiation limits. In our study, there was no age or gender predilection for the presence of accessory canals. Peiris et al. [9] suggested that the rate of incidence of MMC is higher among patients aged 30-40 years old, coinciding with the time of completion of differentiation of the root canal. They stated that this is because of changes in the configuration of the root canal and maturation after the root development completion and apex closure. A constant secondary dentin deposition occurs within the root canals that causes a more complicated configuration of the root canal with the chances of formation of a third root canal in the mesial root of the first and second mandibular molars (15,12). 24.4% of participants of the present study had accessory canals. Increased knowledge of variations in morphological patterns of molars can enhance the success rate for both surgical and non-surgical root canal treatment, thus avoiding treatment failure (16). In vivo CBCT analysis is a clinically effective and non-invasive tool that determines the morphology of the root and root canal (17,18). The limitation of the current study is the CBCT data volumes with different voxel sizes might have led to the inability to detect some MMC, as a narrow MMC might be missed when a larger voxel size is used. The use of limited-field CBCT scans is recommended to make sure smaller voxel sizes are used (19,20).

CONCLUSION

We can conclude that cone beam computed tomography has a very good diagnostic value as it provides a three-dimensional view of the individual tooth. Coming to the

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prevalence of accessory canals in the mandibular molars, only 24.4% of the patients had accessory canal in their mandibular molar. The findings are relevant in an endodontic perspective to improve the prognosis and management.

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