



Prevalence of Untreated Mesio-Buccal 2 Canal in Maxillary First Molars Reported in KSA Since 2010: A Systematic Review

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Several aspects are involved in the success of an endodontic therapy. Because root canal treatment is so complicated, it can't be evaluated using two-dimensional radiographs. Endodontic failure can occur if any section of the canal is overlooked and left untreated. The root canals of the first and second molars are the most complicated of all the maxillary teeth. Locating the mesio buccal (mb2) canal in the maxillary teeth for endodontic treatment is difficult. The mb2 canals are located utilizing three-dimensional technology and cone beam computed tomography (CBCT). The primary goal of this research is to conduct a systematic evaluation of publications that have reported on the occurrence of mb2 canal in maxillary first molars. Many studies in Saudi Arabia have found that the incidence of mb2 in maxillary first molars ranges from 23.3 percent to 70.6

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percent, and that the incidence in maxillary second molars is about 19.8%. A few studies also found that direct viewing of the root, followed by troughing, was used to find an mb2 canal that was not visible on a CBCT scan.

Keywords: Endodontic treatment; root canal therapy; mesio buccal (Mb2) canals; 3 dimensional technology; CBCT; maxillary molars.

1. INTRODUCTION

The secondary mesio buccal (mb2) canal appears to be the dreaded canal that endodontists encounter while repairing maxillary molars. The infuriating component of the root canals of maxillary molars is the mb2 canal, also known as the fourth canal. The mb2 canal was discovered more than a century ago [1]. Professor Walter Hess extracted the hard tissue by calcification of the root canal in human teeth using vulcanized rubber for the first time in 1917, revealing the presence of mb2 canals in the maxillary molars [2]. Most dentists undertake endodontic treatment without accessing the mb2 canals because finding these canals is challenging owing to a lack of appropriate instruments.

In critical circumstances, such as permanent pulpitis, incomplete root canal therapy might cause pain when drinking hot or cold liquids. If the mb2 Canal is left untreated, endodontic root canal therapy failure and apical pathology are more likely [3]. Many dentists think that because the mb2 orifice is mostly covered by a strong layer of dentin, it is immune to bacteria. Dr. Hess reported isthmuses or anastomoses connecting the mb1 and mb2 canals. These linkages allow bacteria from the mb1 canal to move to the mb2 canal [4].

Endodontic failures can now be detected with CBCT radiography by following the underlying untreated mb2 canal. The mb2 canal can be treated with a dental microscope for nonsurgical root canal therapy or apicoectomy. Magnification, utilizing dental loupes, has a 41% success rate, and a dental microscope has a 94% success rate in locating the mb2 canal. In middle-aged and older patients, the mb2 canal is usually found beneath a layer of dentin called the dentin shelf. In order to expose the mb2 orifice, the dentin shelf must be removed [5].

If there are any anatomical complications identified in the maxillary molars, the chemico-mechanical preparations of the root canal may fail. These complexities are extremely significant

[6]. The presence of infected mb2 canals in maxillary first and second maxillary molars was revealed to be responsible for 50% to 90% of the patients [7]. Understanding and having correct information of the structure of the root canal therapy is critical for planning endodontic treatment.

The disinfection, shape, and swelling of all root canals may be critical to the successful implementation of root canal treatment. The canals were previously located using periapical radiographs. The cone beam computed tomography (CBCT), a 3D radiographic picture, is currently employed as an important tool to locate the mb2 canal [7]. As a result, CBCT imaging not only produces high-resolution pictures but also enables for image visualization in the sagittal, axial, and coronal planes.

CBCT can reveal extra canals, root resorption, and disorders affecting the hard tissues. The rate of visibility of the mb2 canal can be enhanced using dental operating microscopes with ultrasonic tips. The position of the mb2 canals has an impact on the clinical success of root canal treatment. The primary purpose of this research is to conduct a thorough review of the literature on the occurrence of untreated mb2 canal in maxillary molars reported in Saudi Arabia between 2010 and 2021. The major goal of this study is to comprehensively examine papers from 2010 to 2021 that reported on the occurrence of mb2 canal of maxillary first molars in Saudi Arabia.

2. METHODOLOGY

This review used PubMed, Web of science, Ebsco, Scopus, Scholarly Articles, Directory of Open Access Journals (DOAJ), and Cochrane online databases to conduct an online web search. The systematic review of the literature was conducted in English. No filters were applied during the initial phase of the assessment to ensure that all studies were available for future screening. Later, filters such as only human research and only adult studies were included. The literature review was carried out by reading

roughly six studies about the prevalence of untreated mb2 canal in maxillary molars in Saudi Arabia. In order to systematically examine the studies that reported on the prevalence of mb2 canal of maxillary first molars in the KSA from 2010 to 2021, the research took 6 months to read and review all the literature and write the article.

2.1 Study Gap

A thorough understanding of the Mesio buccal (mb2) canal will be obtained. In endodontic therapy, the negative effects of an untreated mesio buccal (mb2) canal will be investigated. From 2010 to 2021, the prevalence of untreated mb2 canals in maxillary first molars that result in endodontic therapy failure in the KSA.

3. RESULTS

There were around 6 papers available that documented the data linked to the incidence of untreated mb2 canals in KSA from 2010 to 2021. The three-dimensional cone beam (CBCT) evaluation of extra canals of permanent first molars was published by Al swilen R et al in the year 2018: The prevalence of extra canal identification within the Saudi population was determined by employing 3 D imaging among the Saudi, Jordanian, and Egyptian populations [8]. Al Fouzan conducted research on the mb2 canals and released a paper in 2019 describing how micro CT scanning has been used to locate the second mesio buccal canal in maxillary molars.

Later that year, in 2019, Fouad Abduljabba et al published a long-term study of the prevalence of Second Mesio Buccal canal in maxillary first molars in the Saudi population, reporting a 20.3 percent incidence of mb2 canals in the right maxillary first molars using cone beam computed tomography in Jeddah [9]. Hadi M et al. [10] conducted a study on the root canal morphology of maxillary second molars in a Saudi subpopulation using a Cone Beam computed Tomography in Al-Kharj in 2020, reporting the incidence and prevalence of the four canals in 12 percent (coronal third), 27.6 percent (middle third), and 19.4 percent (lateral third) (apical third). In 2021, Howait M et al. [11] conducted a study titled Assessment of Mesio Buccal canal configuration, prevalence, and inter orifice distance at different root thirds of maxillary first molar using CBCT scans in Jeddah among Saudi

Sub Populations and published their findings. The MB2 canal was discovered in 92 maxillary first molar teeth (86.8%).

4. DISCUSSION

The method utilized to locate the untreated mb2 canal in maxillary molars has a big impact on how common it is. The many approaches utilized to find the mb2 canal in the maxillary molars include root cross - sections with direct vision of the roots, CBCT scan, dental microscopes, and micro CT. In Riyadh, kulild and Peter reported 94.1 percent of the incidence of untreated mb2 canals while analyzing the internal anatomy of maxillary first molars using the root sectioning technique [12].

When compared to the CBCT, Lyra observed that root sectioning is more accurate in investigating the internal anatomy of the maxillary first molars because it allocates more accurately. Another study found that using a micro CT scan, 100 percent of mb2 canal tracing was possible in maxillary first molars and roughly 57 percent in maxillary second molars. Micro CT and CBCT scans are more accurate than digital radiography. The CBCT scan is the most recent addition to the arsenal of modern endodontics. It aids in the diagnosis and treatment planning of endodontic situations, especially those with complicated anatomy. The mb2 canal can be located more precisely with voxel sizes of 0.125 mm and 0.200 mm.

Many researchers have recorded the success rate of CBCT in detecting mb2 canals in maxillary first and second molars in Egyptian, Spanish, Thai, and North American populations. According to Reis, age has a substantial impact on the imaging of the mb2 canals. It is came to the conclusion that the rate of visualization was 9.7% and 81.9 percent in patients aged 20-30 and 60-70 years, respectively [13].

Some other study identified full crown covering as a characteristic that can help prevent the mb2 canal from being located. When patients who took statins to decrease their cholesterol levels were compared to individuals who did not take statins, it was shown that the statin-taking patients had a smaller pulp chamber volume. We can conclude that the HMG-CoA reductase inhibitor (statin) is another element influencing the mb2 canal's placement. The use of 1% sodium fluorescein, which binds to connective tissue and flashes when exposed to blue

light, was proposed by Nalapatti and Glassman [14].

Numerous studies in Saudi Arabia have found that the prevalence of mb2 in maxillary first molars ranges from 23.3 percent to 70.6 percent, and that the incidence in maxillary second molars is around 19.8%. CBCT revealed that 64.6 percent of Saudi patients had mb2 canals in their maxillary first molars, according to Al Shehri [15]. Another study found that selective dentinal extraction (troughing) up to 2mm increased mb2 canal visibility to between 88 and 97 percent [16,17,18]. The prevalence of mb2 canals in the maxillary first molars was estimated to be as high as 86.8% in the Western Saudi Subpopulation [19,20,21]. According to several international research, the occurrence of mb2 canals in maxillary first molars ranges from 69 to 90 percent.

5. CONCLUSION

Many researchers have recorded the success rate of CBCT in detecting mb2 canals in maxillary first and second molars in Egyptian, Spanish, Thai, and North American populations. According to Reis, age has a substantial impact on the imaging of the mb2 canals. As the anatomy of the root development of the molar teeth varies, this is a regular occurrence in dentistry. Due to a lack of identification, the fourth canal, also known as the mb2 canal, is frequently left untreated. The success of maxillary molar treatment hinges on a thorough understanding of the location and treatment of Mb2 canals.

6. LIMITATION

The prevalence of untreated mb2 canals in the maxillary first molar is unknown due to a lack of studies.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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