

# Prevalence of Accessory Canals In Lower Central Incisors

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## Abstract

As part of the importance of knowledge about the internal anatomy of the root canal system, it is important to clarify that there is an intimate relationship between the diagnosis with radiographs, the preparation of an adequate access and detailed exploration of the interior of the dental pieces for a better prognosis in endodontic therapy. **Objective:** The objective of this research is to determine the reported prevalence of two canals in lower central incisors by means of a literature review using tomography and microtomography as an alternative for diagnosis. **Materials and methods:** The research is a documentary analysis of quantitative, qualitative, theoretical and descriptive type in which digital resources from databases such as academic Google: PubMed, Medigraphic, Elsevier, SciELO, between the years 2018 and 2022 were used. Inclusion and exclusion criteria such as population, follow-up of results, ethnicity, language, studies, search period and relevance based on the central theme were applied. **Results:** We found that the most prevalent Vertucci classification was Type I 83% , Type II 1% and Type III 16%. Significantly the presence of two canals was more prevalent in central incisors. **Conclusions:** The most effective method in patients is CBCT imaging, as it allows three-dimensional images to be obtained, allowing the diagnosis of the root canal system in permanent lower central incisors, whose main characteristic is that they present minimal distortions and require less radiation dose for the patient.

**Keywords:** Root canals, two-dimensional radiographs, CBCT images, Cone Beam computed tomography.

## 1. Introducción

The main objective for endodontic therapy is to identify the entrance holes of the root canals, in the incisors the access is traditionally made towards lingual having as an anatomical reference point the cingulum, at present with the implementation of magnification they can be performed with a location more towards the incisal edge, which improves access in a straight line to the root canals, as reported by the study by Benjamin et al.(1). Patel and Rhodes in their practical guide to the preparation of endodontic access cavities indicate that, improper preparation of the access cavity can result in difficulty locating root canals This can result in improper cleaning, modeling and filling of the root canal system. One of the difficulties faced by the clinician in his daily practice is the complexity of the anatomy of the root canal system, where anatomical variations in number and shape can be evidenced, the scientific

evidence collected over the years, allows researchers to classify these variations with various diagnostic methods, such as the number of ducts, shape, length, anastomosis, independent apical foramina as some of the aspects that the authors, In the literature there are several classifications of different authors such as: Okumura, Pucci, Reig, Wein, the most used by Endodontists in the world is in which 8 configurations are mentioned considered as "Gold Standard", which was presented in 1984 by Dr. Frank J. Vertucci, reported a prevalence of 5% in the Type II configuration corresponding to two separate ducts. The research carried out by Allan Cormack in 1963 and by Sir Godfrey Hounsfield in 1964 marked the starting point to develop a prototype and build the first CT equipment used in clinical practice, the main characteristic of this technological advance being based on the potentialization as a diagnostic tool and its function to inspect anatomical elements with greater precision.

## 2. Materials and Methods

In the present research, an analytical and descriptive approach was used, where the collection of bibliographic information used was obtained through an analysis, classification, and search of articles with scientific evidence from 2018 to 2022, where keywords such as: Canals, Accessory Canals, Vertucci, CBCT, Incisor and mandibular were used. In order to develop this bibliographic review article, search engines for digital resources in the database were used from 2018 to 2022, such as: PubMed, scielo, clinicalkey, among others.

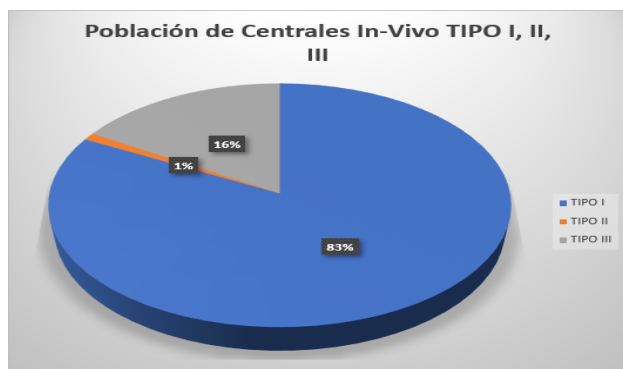
### Inclusion criteria

1. Publications made between 2018 and 2022.
2. Case reports, prospective studies, systemic reviews and meta-analyses that include as a central theme the presence of accessory ducts in lower incisors
3. Scientific evidence from reliable and high-level sources.
4. Scientific articles in English and Spanish
5. Presence of accessory ducts in lower central incisors

### Exclusion criteria

1. Undergraduate thesis
2. Publications that do not meet the established time range, as well as those with a methodology that may compromise the results.
3. Information from non-certified and commercially oriented websites

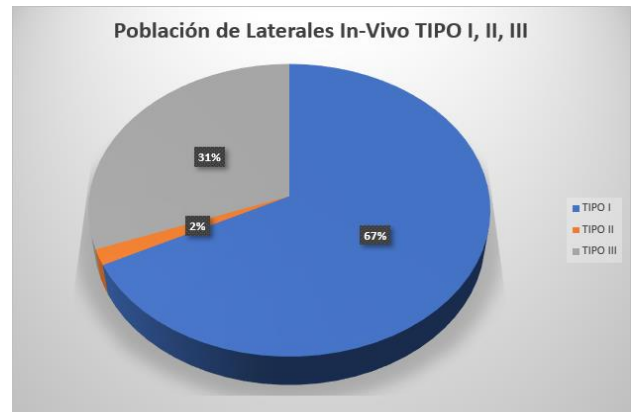
## 3. Results



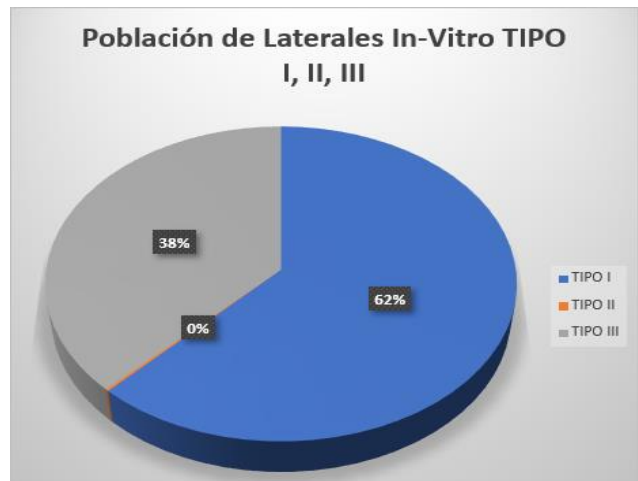
Graph 1 Population of In-vivo Power Plants Type I, II, III.



Figure 1 population of in-vivo central incisors  
Graph 2 Population of central incisors In-vitro Type I, II, III.



Graph 3 Population of lateral incisors In-vivo Type I, II, III.



Graph 4 Population of lateral incisors In-vitro Type I, II, III.

Figure 1 represents a higher prevalence of central incisors of a single conduit of the selected investigations that included in their methodology In-vivo studies, with a statistical average of 83% of the total population reported in the selected studies; followed by dental organs of two Type III ducts as the most recurrent, with 16% prevalence and Type II with 1%. The lateral incisors in in-vivo studies present a similar behavior as the central incisors as represented in Graph 3 with percentages of 67% Type I, 31% Type III and finally 2% Type II. Regarding the analysis of the internal configuration of the central incisors that were considered for the present interpretation of data with an In-vitro methodology, it was determined that there is a higher prevalence of single-duct anatomy corresponding to Type I of the aforementioned classification with 63% of the total population; compared to Type III with 36% and Type II with 1%. The lateral incisor data of this group showed a percentage of 62% for Type I, 0% for Type II and 38% Type III; The Types IV and V that were reported in the articles, showed very low percentages so they were not considered in this research. Based on the articles cited, it is concluded that Type I according to Vertucci's classification is the most recurrent anatomical variation for dental organs in in-vivo and in-vitro studies, both in central and lateral incisors; among the most prevalent data are considered the presence of two ducts in type II and type III.

## 4. Discussion

The studies that are available in the literature are based mainly on populations: Turkish, Iranian, Chinese, Indian taking into account that in Latin America there are not enough studies with which results can be extrapolated which conditions the interpretation and application of information, in the same way there is a discrepancy in the sample size, type of classification, Type of study and variables included such as gender, race, and age.

In most research, cone beam computed tomography was used, since it is a diagnostic method used in endodontics to identify ducts and roots, as well as being a non-invasive method to study the morphology of root canals.

Benjamín et al (13) evaluated 364 lower incisors, analyzed through the radiographic method observed an incidence of 58.6% in type I and did not report any lower pieces with type III classification. Unlike and compared to the present study the results were higher for type I with 95% as well as type III with 3%, this discrepancy may be related to the implementation of three-dimensional images that provides better analysis and to be able to observe in more detail the anatomy of the root canals.

In clinical practice, the prevalence of a second root canal in mandibular incisors is often not localized by radiographs; being one of the main reasons for endodontic failure in these dental organs. There is still the belief that the instrumentation of this type of teeth is simple, without considering the anatomical variations, the endodontic accesses that are traditionally made do not allow the location of the entrance of the ducts, which leads to endodontic failure

Neutrosophic dentistry is a new area of research that incorporates the principles of neutrosophic theory into dental practice. This approach considers the three components of truth, indeterminacy, and falsity to address uncertainties in the diagnosis, treatment, and prevention of dental diseases. In recent years, there has been an increase in the number of studies on neutrosophic dentistry, as evidenced by the publications of Morales Cobos et al. (31), Romero Fernández et al. (32), Vázquez et al. (33), and Ricardo et al. (34). This review aims to summarize and analyze the main findings and contributions of these studies to the field of neutrosophic dentistry.

## 5. Conclusions

The prevalence of type II accessory ducts according to the Vertucci classification in lower central incisors is 1%. while type III is 36%, the most reliable and efficient method for obtaining information about the internal configuration of the lower central incisors is tomography, in mandibular central incisors in in-vitro studies the prevalence type I is the most frequent is 63%, the second type III has prevalence of 36%, type II has a prevalence of 1%.

The information obtained is from other countries, it

is difficult to extrapolate the results to the Latin American population, since there are not enough studies to demonstrate the data investigated.

The use of tomography is advantageous, since it provides extensive three-dimensional information of the internal dental anatomy and achieves the identification of the root canal systems of the first and second mandibular incisors, proving to be a diagnostic tool, being the CBCT one of the most used in recent years being very useful for successes in endodontic therapy

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