Investigation of the Incidence of Nutrient Canals in Diabetic Patients

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Abstract

Aim The purpose of this study is to put emphasis on the importance of identifying certain changes of anatomical structures on routine radiographic examinations which can lead to diagnosis of various systemic diseases and may direct the patient to consultation.
Material and method Our research was conducted by analyzing radiographs taken from 100 healthy patients above 20 years of age who applied to Istanbul University Faculty of Dentistry and 108 patients with diabetes above 20 years of age who applied to Istanbul University Faculty of Medicine's Experimental Medicine Research Center (DETAM).
Results The relationship between type 1 and type 2 diabetes is presented in the tables.
Conclusion According to results, the length of destruction period of diabetes type 1 has a significant role and tends to form more significant numbers of nutrient canals.

Keywords Dentistry, Diabetes, Nutrient canals, Mandible, Radiography

Introduction

The nutrient canals were first described by Hirschfeld in 1923. Other names for nutrient canals are vascular canals or interdental nutrient canals, interdental canals, circulatory canals. In 1942, Sweet found the term 'nutrient canal' to be more appropriate. These canals show linear radiolucency and different relationships with the roots of the teeth (1,2).

In 1977, Britt examined mandibles of cadavers with histologic and radiographic studies and discovered that these canals contain veins and connective tissue elements. For this reason, these are real canals and tend to extend not horizontally but vertically in the antero-posterior direction (3,4).

The incidence of nutrient canals can increase due to factors such as high blood pressure, race, age, periodontal disease or unknown etiology. [5] In this aspect, relation between diabetes and nutrient canal has a positive correlation. This created many comments on the issue (5-7). The current understanding is that the presence of nutrient canals is closely related to systemic diseases (4). Diabetes mellitus, is a disease of high plasma glucose levels and lacking the sufficient insulin. The main characteristic of diabetes is low secretion of insulin and an absolute or relative lack of its usage. Lack of insulin activity can occur due to a decrease in the number of beta cells (8).

Two types of Diabetes Mellitus are presented:
1-Insuline related (Type 1, Juvenile) Diabetes
2-Non-Insuline Related (Type 2, Insulin Resistant type) Diabetes

Type 1 diabetes is characterized by reduced secretion or lacking secretion of insulin. Etiology of the disease is not exactly known but a hypothesis is common where a viral reagent damage to beta cells creates diabetes.

Type 2 diabetes usually occurs more commonly and starts beyond the age of 40. Most of the patients have obesity. It is usually asymptomatic on course and discovered via routine laboratory examinations.

The purpose of this study is to put emphasis on the importance of identifying certain changes of anatomical structures on routine radiographic examinations which can lead to diagnosis of various systemic diseases and may direct the patient to consultation.

Material and Methods

Our research was conducted by analyzing radiographs taken from 100 healthy patients above 20 years of age who applied to Istanbul University Faculty of Dentistry and 108 patients with diabetes above 20 years of age who applied to Istanbul University Faculty of Medicine's Experimental Medicine Research Center (DETAM). The healthy individuals consisted of 54 males and 46 females. The diabetic individuals consisted of 47 patients with type 1 diabetes and 61 patients with type 2 diabetes. These groups were further divided into males and females accordingly. Individuals selected for the research procedure did not have severe periodontal disease. Also the criteria of having at least 2 teeth on the sections of two jaws as frontal, left and right sides was sought. Radiographs taken using a paralleling technique were examined under a negatoscope and classified as either having or not having nutrient canals. All data was statistically tested with chi-square and precise chi-square tests and nutrient canal relationship with gender, type 1 diabetes and type 2 diabetes.

Results

Table 1 reveals the findings on radiographs from the healthy group. Nutrient canal and gender relationship presented on table 2. Nutrient canal and diabetic patient relations are presented on table 3. The results presented in Table 3 have also been discovered and discussed by various researchers previously, but no classifications of diabetic patients or selection criteria were used. Table 4 presents the relationship between type 1 and type 2 diabetes. Table 4 also presents a dividend of canal and no canal

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statement for two types of diabetes.

Table 1: Control group

Canal	No Canal	Total
42	58	100

Table 2: Gender-nutrient canal relation

	Canal	No Canal	Total
Male	26(49%)	28	54
Female	16(35%)	30	46

Table 3: Diabetes-nutrient canal relation

	Canal	No Canal	Total
Diabetic Patients	70(64%)	38(36%)	108

Table 4: Nutrient canal relation with type 1 and type 2 diabetic patients

	Canal	No Canal	Total
Type 1 Diabetes	35(74%)	12(26%)	47
Type 2 Diabetes	35(58%)	26(42%)	61

Discussion

The importance of intraosseous space nutrient canals, which contain veins, nerves, and connective tissues, has been discussed in many research studies(9).Some researchers, such as Lovett and Ryder, state that nutrient canals are normal anatomic structures that tend to appear on all segments of the mandible and maxilla, regardless of whether they are edentulous or dentulous(10). Goodman-Topper's work on children between the ages of 6-10 revealed that these structures are not pathological but rather anatomically normal (4,7). Researchers reported these canals appear mostly on mandible incisor site, followed by mandibular molar site and then maxillary molar sites (5,7,11). Researchers determined through radiographic studies that anterior mandibular bone density and the incidence of finding nutrient canals increased. They also found that these canals appear on the labial or vestibular sides of teeth (7,12).

Kanji Kishi discovered through research on mandibles that the incidence of finding nutrient canals tends to increase in cases of severe periodontal problems, advancing age, and edentulous patients (2,3). Emphasis was placed on the presence of canals; alveolar bone thickness, spongy and cortical bone quality, and edentulous presence in the mandible were considered important factors. The presence increases with higher than average bone density with smaller trabeculae of bone (10). An increased density creates a sclerotic boney change of the trabeculae in the presence of periodontal disease (5,13).

Patel and Wuehrmann discovered an increased incidence of nutrient canals in patients with severe periodontal problems through radiographic studies (14). Bilge and Kansu's research reveals that an increased number of nutrient canals detected on patients with periodontal issues and periodontal issues are related with age - therefore, periodontal compromised patients showing increased nutrient canals is related to advancing of the age of the patients (1,15).

In this research, a relation between diabetes mellitus and nutrient canal presence was searched. According to our research nutrient canals and diabetes mellitus has a relation. These findings concurs with Patel and Wuehreman (10,13,14), but differs with Kansu's research. However, the researchers mentioned above did not classified diabetes mellitus as type 1 and 2 on their research. In our research this differentiation was made with a value of $p<0,05$ with type 1 and $p>0,06$ with type 2 high significance. When these considered; both proportional difference of values and different outcomes has a clear showing on the topic.

Conclusion

According to these results, the length of destruction period of diabetes type 1 has a significant role and tends to form more significant numbers of nutrient canals

Declarations

Author Contributions: *Conception/Design of Study- M.M.A., M.M.; Data Acquisition- M.M.A., M.M.; Data Analysis/Interpretation- M.M.A., M.M.; Drafting Manuscript- M.M.A., M.M.; Critical Revision of Manuscript- M.M.A., M.M.; Final Approval and Accountability- M.M.A., M.M.; Material and Technical Support- M.M.A., M.M.; Supervision- M.M.A., M.M.*

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