CLINICAL PRACTICE

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# The role of calcium hydroxide in the treatment of chronic apical periodontitis in patients with type 2 diabetes – a case report

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**Abstract**: *From an anatomical perspective, the dental pulp is a connective tissue with a specific microcirculatory system with repairing abilities in order to preserve the vitality of the pulp15. Different therapeutic methods in treating the affected dental pulp can be compromised by different factors and can lead us to failure. Due to disorders emerged in the microcirculatory system, the treatment of the affected dental pulpin patients with type 2 diabetes is an additional challenge. Type 2 diabetes can impact different functions of the patients' immune system, with a predisposion to chronic inflammation, progressive tissue degradation and reduced tissue repairing15. Regarding the endodontic therapy of the affected dental pulp in patients with diabetes mellitus (DM), an important role in the treatment of pulpal complications is played by the calcium hydroxide which is considered „the golden standard" because of its excellent properties, the very alkaline pH being one of the most important.*

**Keywords**: *diabetes mellitus, chronic apical periodontitis, calcium hydroxide*

## INTRODUCTION

Diabetes mellitus is one of the most frequent metabolic disorders affecting 366 million patients of all ages, according to the statistical data of the year 2011 [26,1, 21]. It is a disease that is chronic, complex, progressive and crippling and that has no current treatment, diabetes being characterized by a partial or total deficiency of insulin production [5].

Patients with diabetes mellitus have a tendency to develop oral complications such as: cavities [5,27, 22], pulpal and periapical pathology [5,10,14,23] and, very often, periodontal disease [2,10,4,14,12,16,20, 1,7], which is considered the sixth complication of DM and the most chronic affection [20,1].

Many materials have been used in the endodontic treatment but unfortunately none of them managed to succeed in satisfying the complete requirements of an ideal sealer [11,19].

The pure calcium hydroxide paste has an increased pH value of approximately 12.5-12.8 [9] and it is chemically

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classified as a strong base. Its main actions are accomplished through the dissociation of $Ca^{2+}$ and $OH^-$ ions affecting the vital tissues, inducing the deposition of hard dental tissue and possessing antibacterial properties [24].

$Ca(OH)_2$ is an antimicrobial agent with a bactericidal effect, and by using it in the course of the endodontic treatment prevents the apical periodontium from becoming infected [25]. Moreso, it is being used to reduce inflammation (thus decreasing the pain), helping eliminating the apical exudate in order to control the root resorption and to prevent the contamination of the apical periodontium between treatment sessions [9].

## MATERIALS AND METHOD

Patients diagnosed with type 2 diabetes have participated in this study. During the radiologic exam we have ascertained that these patients presented radiologic modifications of the periapical tissues with obvious signs of root and bone resorption.

These patients have been informed about the treatment they were about to receive and have signed an informed consent agreement to participate in our study.

Inclusion criteria for participation in the study: 1. patients over 18 years old diagnosed with type 2 diabetes; 2. patients with mature teeth that presented an apical radio translucency at the radiologic exam.

All patients have been submitted to an orthograde endodontic treatment. The teeth have profited by an intermediary session when a paste with calcium hydroxide and radio opacifying agent has been applied in the root canals.

For every patient we have used dam isolation – a diga. The endodontic therapy has been conducted using rotary instrumentation, the crown-down technique and by successively applying endodontic irrigating solutions such as NaOCl 5.25% and citric acid 40%.

Between the therapy sessions the root canals were filled with a calcium hydroxide based paste and for the obturation of the tooth crown we have used glass ionomer cement.

The calcium hydroxide based paste was introduced using a Lentulo spiral filler and condensed using paper cones as pluggers. In the next therapy session the $Ca(OH)_2$ paste is removed using alternative irrigation with NaOCl 5.25% and citric acid 40%,using ultrasonic activation, NaOCl 5.25% and EDTA 17% and manual instrumentation for the working length.

An intermediate radiography was conducted before the obturation of the root canals with gutta-percha and the warm compaction technique.

## RESULTS

**Clinical case no. 1**

The patient M.C. presents a chronic apical periodontitis in 1.7, following an incomplete endodontic treatment (Figure 1).

The patient had several recurrent acute episodes that induced a right odontogenic sinusitis that has been diagnosed some years ago.

Following the last otorhinolaryngology checkup the patient was sent for an oral and dental evaluation and also for a radical sinus surgery.

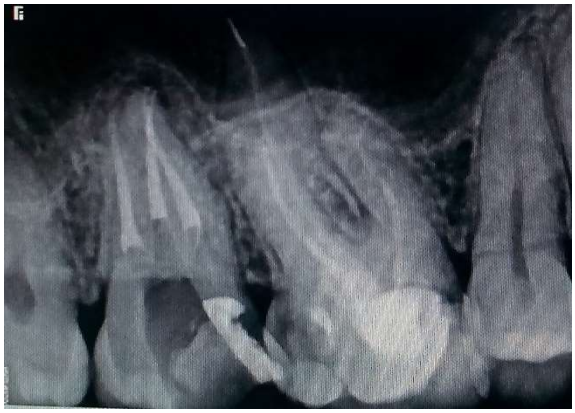
We have opted for a non-surgical conservative endodontic treatment (orthograde approach) finalized in the second therapy session.

**Figure 1:** Initial radiological aspect of 1.7

As an intermediate root obturation we have used a calcium hydroxide based paste and an opacifying agent (Figure 2).

**Figure 2:** The radiological aspect of 1.7after root obturation with $Ca(OH)_2$ as intermediary therapy (after 4 months).

**Figure 3:** The radiological aspect of 1.7. The gutta-percha root canal obturation.



The apical radio translucency has decreased significantly and the patient's clinical status has improved (Figure 3). The subjective signs of sinusitis have progressively amended.

**Clinical case no. 2**

The patient V.N. came in our clinic for periapical bone lesions in 3.6 following an apical resection procedure after endodontic treatment (Figure 4).

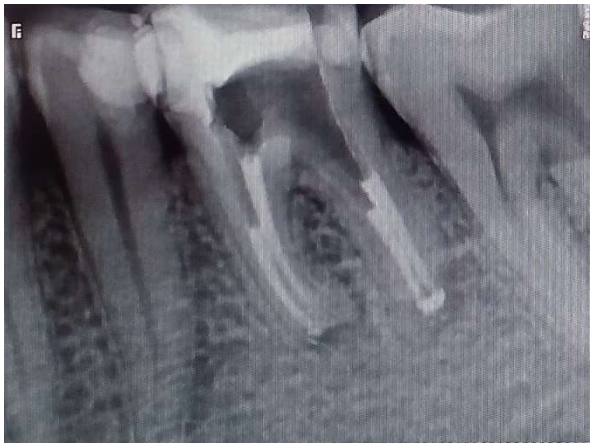
We made the decision to conduct a non-surgical conservative treatment (orthograde approach) finalized in 2 treatment sessions.

For the intermediate root canal obturation we have used $Ca(OH)_2$ paste and opacifying agent for a better radiographyic imaging (Figure 5).

**Figure 4:** The initial radiological aspect of 3.6

**Figure 5:** The radiological aspect of 3.6 with its roots canals intermediately obturated with $Ca(OH)_2$ (after 3months)

**Figure 6:** The radiological aspect of 3.6. Verifying the root canal obturation with gutta-percha.



After the decrease of the apical translucency, 3.6's roots were permanently obturated using the warm vertical compaction technique (Figure 6).

## DISCUSSION

The success criteria in endodontic treatment were established in 1994 by the European Society of Endodontics and include the absence of pain, inflammation and fistula, maintaining the dental function, the presence of radiological evidence to show a proper periodontal ligament space and the absence of apical periodontitis and root resorption [8].

The endodontic treatment conducted was non-surgical and conservative using the orthograde approach under Diga isolation and benefiting abundant irrigation with endodontic irrigation solutions.

We have varied the time in which the calcium hydroxide paste was maintained in the root canal accordingly.

In both cases we can observe the initiation of the periradicular bone remineralization process.

The ceasing of the resorption of the external radicular necrotic pulp can be exclusively attributed to the elimination of the necrotic tissue and to the conducted antibacterial intracanalar treatment [18].

The diffusion of the OH-ions through the dentin depends upon the duration of the medication, upon the diameter of the dentinal tubules (cervical vs apical) and upon the ablation of the layer smear (for an increased diameter of the dentinal tubules). Moreso, the diffusion of the OH-ions into the root resorption areas where the pH is acid has a positive effect on the progression of the root's inflammation and resorption [17].

The $Ca(OH)_2$ based paste can be used successfully for the management of perforations, horizontal radicular fractures and radicular resorptions [17].

Gergely JM. et al. have shown that calcium hydroxide is frequently recommended in the treatment of periapical abscess because of its strong alkaline pH (approximately 12). The antibacterial effect is due to the dissociation of $Ca(OH)_2$ into $OH^-$ and $Ca^{2+}$, that also has a healing effect on the damaged tissues [13, 6].

The endodontic treatment in patients with diabetes and infections of the radicular canal can be correlated with a decrease of the treatment's success and therefore the dispensarization of these patients is mandatory [3].

## CONCLUSIONS

In case of patients with recurrent treatments it is advisable to perform a non-surgical conservative treatment.

Regarding the evaluation of the success of the examined endodontic treatments we have concluded that the success rate in type 2 diabetes patients is high only when the treatment is thoroughly conducted.

We cannot say that the type 2 diabetes patients have an increased predisposition for developing periradicular lesions because the endodontic treatment in these patients was incorrectly conducted because of incomplete root canal treatment.

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