

# Ceramic implant vs endodontic treatment

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## Introduction

Where are the evaluation criteria to determine the success of endodontic treatment? Why are there no additional tools to determine local painlessness versus a systemic toxicity focused approach? How can patients be convinced to get their root fillings replaced with immediate ceramic implants? In the following, scientific based arguments will be given from an author having 16 years of experience in ceramic implants. His scientific based publications are being released in international PubMed indexed medical journals and the research on this topic was published in the *International Journal of General Medicine* ("Stimulation of pro-inflammatory cytokines by volatile sulfur compounds in endodontically-treated teeth", Lechner, von Baehr).

## New methods to reduce risks

Researchers in the field of modern dental endodontics are well aware of the problem of bacterial colonisation in the tubules of root-filled teeth (RFT), and new methods for reducing these risks are constantly being developed. A control X-ray image is standard practice and considered to be the only method used for the diagnostic assessment of RFT. However, X-ray scans are insufficient, since chemically defined toxins cannot be visually identified. Even though X-rays of root canal treatment do not show anomalies, these areas often contain bacteria, as well as inflamed or necrotic tissue, which proves that not all periradicular inflam-

mations can be diagnosed with the help of X-rays<sup>1</sup>. Anaerobes are sulfate-reducing bacteria and are most frequently isolated from primarily and secondarily infected root canals. Persistent microorganisms in endodontically-treated teeth are the main producers of methyl mercaptan, dimethyl sulfide and diethyl sulfide (Merc/Thio)<sup>2</sup>. In the past, there was no process available to reliably identify RFT, using the suspected outgas of Merc/Thio produced by bacterial degradation products and biogenic amines in the form of volatile sulfur compounds (VSC). Thus, we expanded our investigation to develop an additional evaluation criterion in order to semiquantitatively determine the presence of VSC, using a volatile sulfur hydrogen compound indicator (VSHCI).

## The chairside test

Hydrogen sulfide can be displayed by utilising the chairside test called OroTox<sup>®</sup>. The procedure is painless and simple to perform: A nonsterile paper tip—or alternatively, a small sponge, is inserted into the sulcus of the suspected tooth. After one minute it is removed and the sample from the sulcus fluid is inserted into the volatile compound reagent container. After five minutes, the staining of the reagent is examined: The more hydrogen sulfide compounds are present in the sample, the more the indicator liquid turns yellow. The VSCI detects the elevated discharge of bacterial toxins in the sulcus of the suspected teeth, based on six gradings (0 = zero; 1 = moderate; 2 = evident; 3 = clear; 4 = strong; and 5 = extremely strong). The degree of colouration of the reagent may be used to semiquantitatively determine the amount of toxin that can be resorbed in the sulcus (Fig. 1).

The chairside test helps dentists to decide whether RFT should be viewed as critical for a patient with immunological diseases, due to a high Merc/Thio content<sup>4</sup>, even if X-rays of the root tip do not indicate signs of change. We have evaluated the *ex vivo* immune response of peripheral blood mononuclear cells (PBMC) to VSC in 354 patients with systemic diseases. The findings correlate with semi-quantitative values of a volatile sulfur compound indicator (VSCI) applied directly to the RFT. Our data elucidate the role of VSC in patients with immunologic diseases and the role of the chairside test OroTox<sup>®</sup> in correlation to IFN $\gamma$  and IL-10 sensitisation in PBMC. The connection between

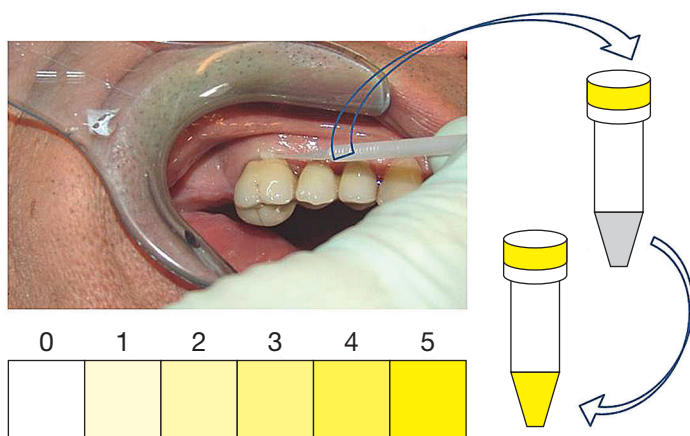


Fig. 1: The semi-quantitative chairside test; colour change indicates higher concentration of sulphydrils.

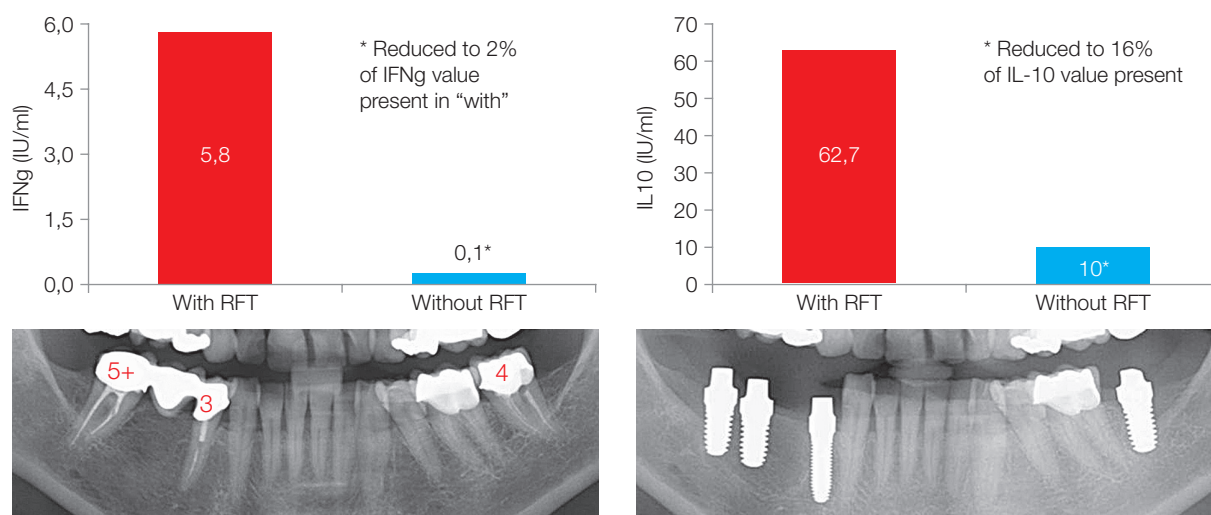


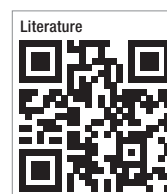
Fig. 2: An example of a clinical sample tested for IFN $\gamma$  and IL-10 sensitisation to Merc/Thio exposure before and after the removal of RFT.

*ex vivo*-stimulated cytokines and endodontically-derived sulfur components is supported by the fact that the number of interferon gamma and/or interleukin-10 positive sensitised patients declined significantly three to eight months after the extraction of the corresponding teeth. Figure 2 shows a patient with dramatically lowered levels of IFN $\gamma$  and IL-10, after the exchange of RFT with high levels of VSC, with regard to the OroTox<sup>®</sup> test.

## Identifying disease correlations

Scientific research finds that diabetes correlates significantly with a higher prevalence of periapical radiolucencies in endodontically treated teeth.<sup>5</sup> In contrast, critics of root canals believe that they may contribute to immunological diseases and consider X-ray imaging to be insufficient for the purpose of determining possible systemic effects of toxins that derive from root fillings. Apical periodontitis (AP) is a chronic inflammatory disorder of the periradicular tissues caused by bacterial invasion at the apex of the tooth root.<sup>6</sup> There are epidemiologic studies proving the correlation between AP and various diseases. For example, AP is associated with increased rates of myocardial infarction (with acute coronary syndromes occurring 2.7 times more frequently in patients with such infections<sup>7</sup>), as well as clinical depression, increasingly severe depression and a reduced quality of life.<sup>8</sup> Moreover, AP is also associated with an increase in the translocation of gram-negative bacteria.<sup>9-10</sup> A study on a total of 248 patients with acute myocardial infarction, as well as 249 healthy controls underlines that patients, who have experienced a myocardial infarction, had a higher risk of developing inflammatory processes—especially of endodontic origin—than healthy patients.<sup>11</sup> Patients presenting lesions of endodontic origin or pulpal inflammation had an increased risk of developing a coronary heart disease.<sup>12</sup> Bacterial DNA that is typical for an endodontic infection, mainly oral viridans streptococci, was measured in 78.2% of thrombi, and periodontal pathogens were measured in 34.7%. Dental infections and oral bacteria, especially viridans streptococci, are associated with the development of an acute coronary thrombosis. There is also a significant correlation between periodontitis and depression.<sup>13</sup>

However, there is no data showing a correlation between VSC levels in the root canals of patients with AP and systemic and immunological diseases. We presented a study, which is one of the first to statistically link a group of patients to multiple systemic and immunological diseases (SyD) with endotoxin levels originating from AP (*Dentistry*, Volume 8, Issue 3; "Impact of Endodontically Treated Teeth on Systemic Diseases"; Lechner, von Baehr). The study indicates there is a significant increase in root canal endotoxin levels in patients with AP, in comparison to healthy controls (HC) without AP. The comparison made between the HC and SyD groups provides the first indication of the possible connections between RFT and SyD. It indicates that endodontically treated and root-filled teeth may enhance immunological and systemic disturbances on the one hand and may be involved in the development of SyD on the other hand. Vice versa, the presence of SyD may influence, in some way, local inflammatory reactions such as AP. High local H<sub>2</sub>S values with the reagent, as well as a high frequency of immunosensitisation to biogenic amines in patients with SyD amplify this correlation. With regard to the increasing prevalence of immune system diseases, widespread endodontic measures should be assessed more critically. For practitioners, the local measurement of VSC, using the OroTox<sup>®</sup> test, draws attention to the correlation between the outcome of endodontic treatment and systemic diseases. For more than 15 years, we offer ceramic implant replacements as an alternative to RFT in order to help successfully avoiding SyD in our patients.



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