

Oral malodor associated with internal resorption

Masahiro Yoneda, Toru Naito, Nao Suzuki, Toru Yoshikane and Takao Hirofuji

Section of General Dentistry, Department of General Dentistry, Fukuoka Dental College, Fukuoka, Japan

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Abstract: We report a case of oral malodor associated with internal resorption. A 39-year-old male attended our hospital complaining of oral malodor. Utilizing organoleptic measurement, the halimeter test and gas chromatography, it was diagnosed as a strong halitosis caused by oral origin. The pocket probing depth of tooth 21 was 10 mm, and X-ray examination revealed a vertical bone loss around this tooth. The patient had received periodontal treatment at two dental offices previously, but the periodontal conditions and oral malodor persisted. We performed an initial periodontal preparation, however a deep pocket remained. We therefore performed a surgical inspection including flap reflection, and found that the tooth had a large perforating defect in the distal surface. The extracted tooth had multiple perforating defects covered with granulation tissues on all root surfaces including the root apex. Taking into consideration the anamnesis and X-ray examination of the extracted tooth, internal absorption was considered to have been the cause of the multiple perforating defects. After extraction of the causative tooth, oral malodor dramatically decreased. To our knowledge, this is the first report of an oral malodor associated with internal resorption. (J. Oral Sci. 48, 89-92, 2006)

Keywords: oral malodor; periodontitis; internal resorption; periocheck; multiple perforations.

Correspondence to Dr. Masahiro Yoneda, Section of General Dentistry, Department of General Dentistry, Fukuoka Dental College, 2-15-1 Tamura, Sawara-ku, Fukuoka 814-0193, Japan
Tel: +81-92-801-0411
Fax: +81-92-801-4909
E-mail: yoneda@college.fdcnet.ac.jp

Introduction

Increasing numbers of patients are worrying about their breath odor (1). The major source of bad breath is volatile sulfur compounds (VSC), and most are considered to originate in the oral cavity. VSC are produced by bacteria such as *Porphyromonas gingivalis* in the periodontal pockets and tongue coating (2). The relationship between periodontal conditions and oral malodor has been widely investigated. Most patients with genuine halitosis caused by periodontitis become free from bad breath after periodontal treatment. In this case report, we describe a patient with halitosis who did not respond to an initial periodontal preparation. The surgical inspection revealed that the periodontitis was associated with multiple perforations caused by gross internal resorption.

We further describe the oral malodor associated with internal resorption and application of a peptidase-detection kit for monitoring the decrease of odor-producing bacteria.

Case Report

A 39-year-old male attended our hospital complaining of oral malodor. He first noticed his bad breath about 3 years ago and had visited two dental offices. The doctors diagnosed periodontitis, and he underwent periodontal treatments that included scaling and root planing. The overall periodontal condition improved, but oral malodor was not alleviated, and he consequently visited our hospital.

We measured his breath odor in our halitosis clinic using 3 methods: organoleptic measurement (3), the halimeter test and gas chromatography (4). The organoleptic score was 3 (easily detectable bad smell), and all the VSC such as hydrogen sulfide, methyl mercaptan and dimethyl sulfide were above the positive level (Fig. 1).

We performed an oral examination to identify the cause of oral malodor, however, we did not detect any large caries or thick plaque. The probing depth of all the teeth,

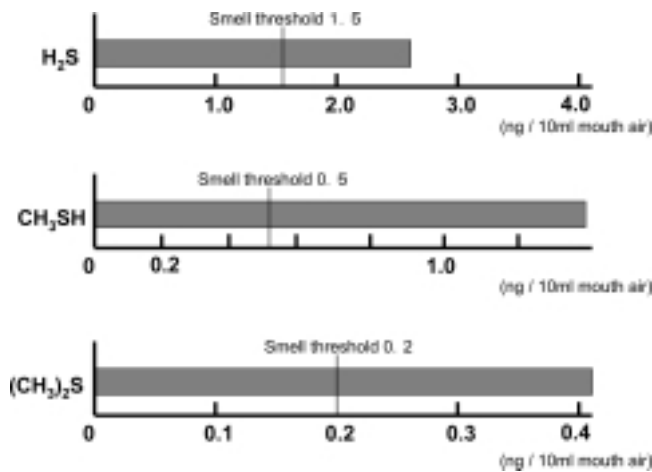


Fig. 1 Volatile sulfur compounds at first visit. Hydrogen sulfide (H₂S), methylmercaptan (CH₃SH) and dimethylsulfide [(CH₃)₂S] were above the smell threshold level.

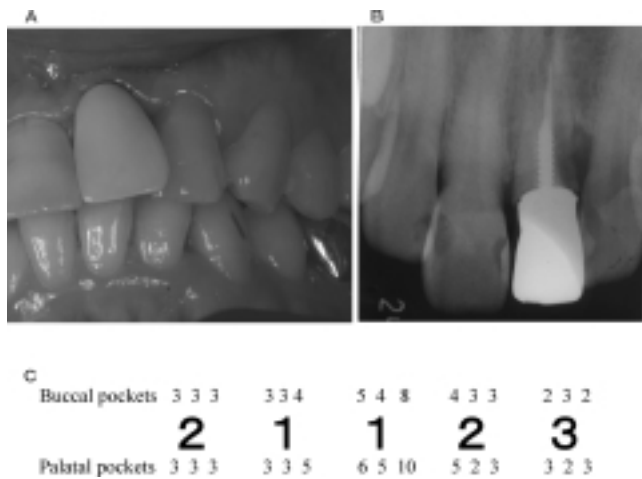


Fig. 2 Front view, X-ray photograph and probing depth of anterior teeth at first visit. Slight gingival inflammation was observed around the margin of tooth 21 (A). Bone resorption was observed at the distal area of the tooth 21 (B). Deep pockets were detected at the distal area of this tooth (C).

Table 1 Change of organoleptic score and periocheck result after extraction of causative tooth

Stage	organoleptic score (OLS)	periocheck test	
		periodontal pockets	tongue coating
before treatment	3	++	+
after extraction ¹⁾	1	N.D ²⁾	-

1) One month after extraction of tooth 21, each test was repeated.
 2) Not determined. Tooth 21 was already extracted.

except tooth 21, was less than 4 mm, and no mobile tooth was found. We did, however, observe deep periodontal pockets (10 mm) around teeth 11, 21 and 22 and slight gingival inflammation in this area (Fig. 2A, 2C). An X-ray examination indicated a vertical bone resorption in tooth 21 (Fig. 2B) and hence we diagnosed the halitosis as a pathologic halitosis caused by periodontitis. We applied Periocheck (Sunstar, Osaka, Japan) in order to monitor the presence of odor-producing bacteria in the periodontal pocket and tongue coating. The results of the test were double positive and positive, respectively (Table 1).

We performed initial periodontal treatment that included tooth brushing instruction, scaling and root planing. The gingival condition improved and the probing depth of most of the teeth became less than 3 mm, however, a 6-8 mm pocket remained around tooth 21. We performed a surgical inspection with flap reflection on tooth 21 and found the tooth had a perforating defect in the root surface. Restoration was impossible, so the tooth was extracted.

The extracted tooth was covered with granulation tissue (Fig. 3). After removing the soft tissue, multiple perforating defects were found all around the root surface including the apex (Fig. 4). X-ray examination of the extracted tooth from different directions led us to conclude that the perforation was caused by internal resorption (Fig. 5). This particular tooth had a traumatic injury in a traffic accident about 20 years ago. Taking into account this history, we concluded that it was an internal resorption, resulting in multiple perforations. As the pulp had already been removed and the tooth restored, we were unable to further examine the condition of the internal resorption.

After extraction of tooth 21, the Periocheck test was negative (Table 1). Examination of breath odor using the same techniques as the first visit revealed an organoleptic score of 1 (no bad smell was detectable) and the VSC levels measured with the halimeter and gas chromatograph were all below the positive level (Fig. 6).

The protocols for measuring breath odor and bacterial examination were approved by Fukuoka Dental College ethics committee (approval number 58).

The authors understand the Declaration of Helsinki, and have discussed the present case report with the patient and received informed consent.

Discussion

There are many causes of oral malodor such as tongue coating, deep caries, inadequately fitted restorations and lack of saliva flow (5); periodontitis is also one of the most important causes of bad breath (2). When deep pockets are found, periodontal treatment usually results in a good outcome.

In the current case study, the patient had worried about his bad breath for many years. He had received periodontal treatment on two occasions at different dental offices but the results were unsuccessful. We also performed periodontal treatment, however the periodontal condition around the particular tooth and the oral malodor did not respond. Reflection of a flap revealed a perforated tooth that was the result of internal resorption, which in turn was the cause of the localized periodontitis. We sometimes encounter localized periodontitis, which does not respond to an ordinary initial periodontal preparation. In such cases, surgical inspection with flap reflection may reveal the causes, such as root fracture, cemental tear, and perforating defects.

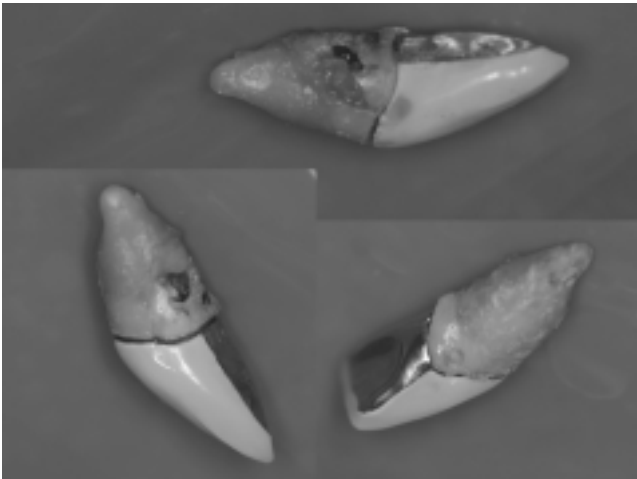


Fig. 3 The tooth 21 just after extraction.
The tooth had multiple perforations covered with granulation tissue.



Fig. 4 The tooth 21 after removing the soft tissue around the tooth.
Multiple perforations in all tooth surfaces were observed.

The mechanism of internal resorption is not fully understood (6), but it is considered to be in part related to the dental trauma (7). The causative tooth in this case had suffered trauma in a traffic accident about 20 years ago. During the injury, pulp may have been damaged and internal resorption may have started. If the internal resorption had been found at an early stage, it might have been stopped (8). Internal resorption is usually asymptomatic and is occasionally found during X-ray examinations, but some severe internal resorption may result in perforation of the root surface or fracture of the tooth (9). If the perforating defect was localized to the root

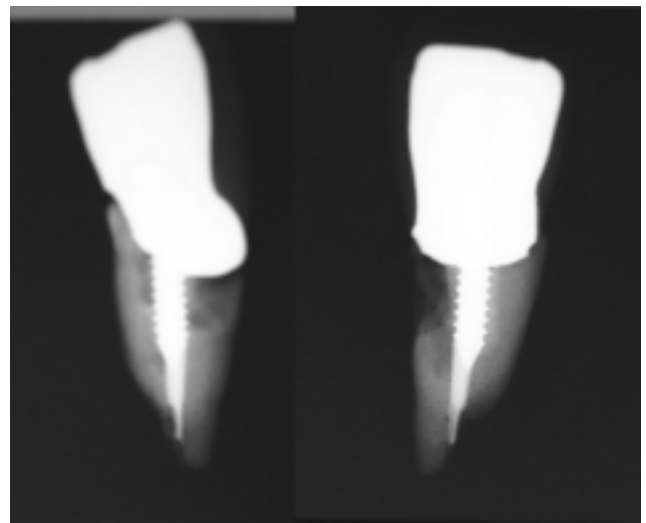


Fig. 5 X-ray photograph of extracted tooth 21 from different direction.
Internal resorption seems to lead to perforation.

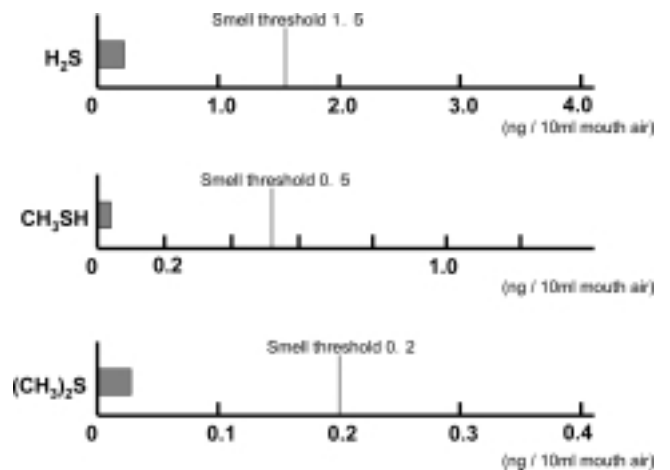


Fig. 6 Volatile sulphur compounds after extraction of the causative tooth.
Hydrogen sulfide (H₂S), methylmercaptan (CH₃SH) and dimethylsulfide [(CH₃)₂S] were below the threshold level.

apex, the resorption of alveolar bone may not have occurred. In such cases, endodontic surgery may bring about a good outcome. The tooth in this case, however, showed multiple perforations, including the area near the tooth crown, which led to the alveolar bone loss. Since the size of perforating defect was too big to restore, we had to extract the tooth.

The importance of bacteriological examination in the treatment of periodontitis and halitosis is generally accepted. Some periodontopathic bacteria are known to produce peptidase activity, which results in odor production. Hence, peptidase-detection substrates such as BANA have been used (10). In this case, we applied the Periocheck test to monitor the odor-producing bacteria, such as *P. gingivalis*, *Tannerella forsythia*, and *Treponema denticola* (11). Before treatment, the Periocheck test was positive both for periodontal pockets and tongue coating. After removing the causative tooth, the Periocheck score was negative, indicating a decrease in odor-producing bacteria. At this stage, oral malodor had almost disappeared and the patient was satisfied.

One of the most important factors in this case is the time after the first traumatic injury. If the internal resorption or perforation had been found earlier, the tooth might have been restored. It is speculated that granulation tissue increased after the perforation, and that granulation tissue is considered to be the true cause of malodor. These results indicate that proper diagnosis including surgical inspection is important to treat halitosis caused by unusual localized periodontitis.

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