

## Case Report

# Improvement of Eczematous Symptoms after Removal of Amalgam-like Metal in Alveolar Bone

Kenichi Matsuzaka, Ryohei Mabuchi\*, Hiroshi Nagasaka\*\*,  
Masao Yoshinari\*\*\* and Takashi Inoue

*Department of Clinical Pathophysiology, Tokyo Dental College,  
1-2-2 Masago, Mihama-ku, Chiba 261-8502, Japan*

\* *Mabuchi Dental & Orthodontic Clinic,  
2-4-5 Chuo, Aoba-ku, Sendai 980-0021, Japan*

\*\* *Department of Oral Surgery, Miyagi Children's Hospital,  
4-3-17 Ochiai, Aoba-ku, Sendai 989-3126, Japan*

\*\*\* *Department of Dental Materials Science, Tokyo Dental College,  
1-2-2 Masago, Mihama-ku, Chiba 261-8502, Japan*

Received 27 January, 2006/Accepted for publication 27 March, 2006

## Abstract

This case report describes a 55-year-old woman with an amalgam-like metal remaining in alveolar bone after root-end sealing in 1964, and who then developed eczematous facial symptoms from 2000 onwards. Removal of the amalgam-like metal material improved the symptoms.

Key words: Metal allergy—Root-end sealing—Amalgam-like metal—Eczematous symptoms

## Introduction

To prevent recurrence of radicular cysts or periapical disease, reverse root-end sealing is usually performed after root-end amputation. Although amalgams are popular materials for reverse root-end sealing, recently other materials, such as 4-META MMA/TBB resin, mineral trioxide aggregate, etc., have also been developed and used<sup>4,10</sup>. As might be expected, biomaterials that react with tissues should be avoided for dental treatment. The effect of metallic biomaterials on the body varies

between individuals, and severe systemic reactions sometimes develop. In particular, materials used in reverse root-end sealing can have a strong effect because of their implantation into the tissue. Furthermore, there has been a recent increase in patients showing metal allergies following dental treatment. This case report describes an amalgam-like metal causing eczematous symptoms in a patient's face 36 years after root amputation and sealing, and subsequent improvement in those symptoms following the removal of that material.

Table 1 Time course of symptoms

|             |   |
|-------------|---|
| 1964        | Root-end amputation of left maxillary central incisor   |
| 1977        | Extraction of left maxillary central incisor and curettage of granulation tissue around root-end area |
| 1994        | Diarrhea and nausea after eating foods with zinc, such as oysters, shrimp, etc.                       |
| 2000        | Appearance of eczematous symptoms on face   |
| 2003        | Deterioration of eczematous symptoms  |
| Sept. 2003  | Admitted to Mabuchi Dental & Orthodontic Clinic   |
| Oct. 2003   | Removal of granulation tissue with foreign bodies in maxilla  |
| August 2004 | Facial symptoms improved.   |

## Case

### 1. Patient

A 55-year-old woman admitted initially to the Mabuchi Dental & Orthodontic Clinic in September, 2003, chiefly complaining of an esthetic disorder of gingival pigmentation in her maxillary incisor area.

### 2. Previous history

Since 1994, the patient has experienced diarrhea and nausea after eating foods containing zinc, such as oysters and shrimp. In 2000, facial an eczematous erythema developed, which a dermatologist diagnosed as senile verruca. In 2003, exanthema with pruritus developed on her eyelids and cheeks. A patch test was performed by a dermatologist, who tested for allergies to tin, indium, zinc, aluminum, gold, palladium, manganese, silver, chromium, cobalt, copper and formalin. Tin, indium and zinc reacted positively.

### 3. History of symptoms

The patient had a root amputation performed on a central incisor in the maxillary left region in 1964 at another dental office. Some dispersal amalgam-like metal which remaining after the operation was later extracted in 1977. At that time, no subjective symptoms were noted in that region, and a bridge was set. Table 1 shows the time course of symptoms.

### 4. Present symptoms and treatment

Symptoms on the face included diffusely flattened erythrogenic areas with a diameter of 3 to 15 mm in the cheek and neck regions (Fig. 1). A black discoloration with an indistinct boundary in the gingiva of her maxillary left incisor region was also observed (Fig. 2a). Orthopantomography showed a granular or massive radiopaque area from the maxillary alveolar region to the lower part of the anterior nasal aperture (Fig. 2b).

Metal allergy was suspected, and an extirpation operation for foreign bodies and granulation tissue was performed on October 25, 2003 at the Mabuchi Dental & Orthodontic Clinic. After fixation with 10% formalin, the specimens were sent to the clinical laboratory of the Tokyo Dental College for analysis of elements. After paraffin sections of 15 micrometer in thickness were prepared in routine fashion, they were de-paraffinized, and EPMA and XMA quantitative analysis was used to analyze foreign materials. The components detected consisted primarily of silver and tin (Fig. 3a, b). After removal of granulation tissue with foreign bodies, face symptoms showed a slow improvement. Figure 4 shows the relieved symptoms on the face in March, 2005 at a follow-up. Photographs of the oral condition and an orthopantomograph taken 10 months after the removal operation are shown in Fig. 5. The orthopantomograph revealed

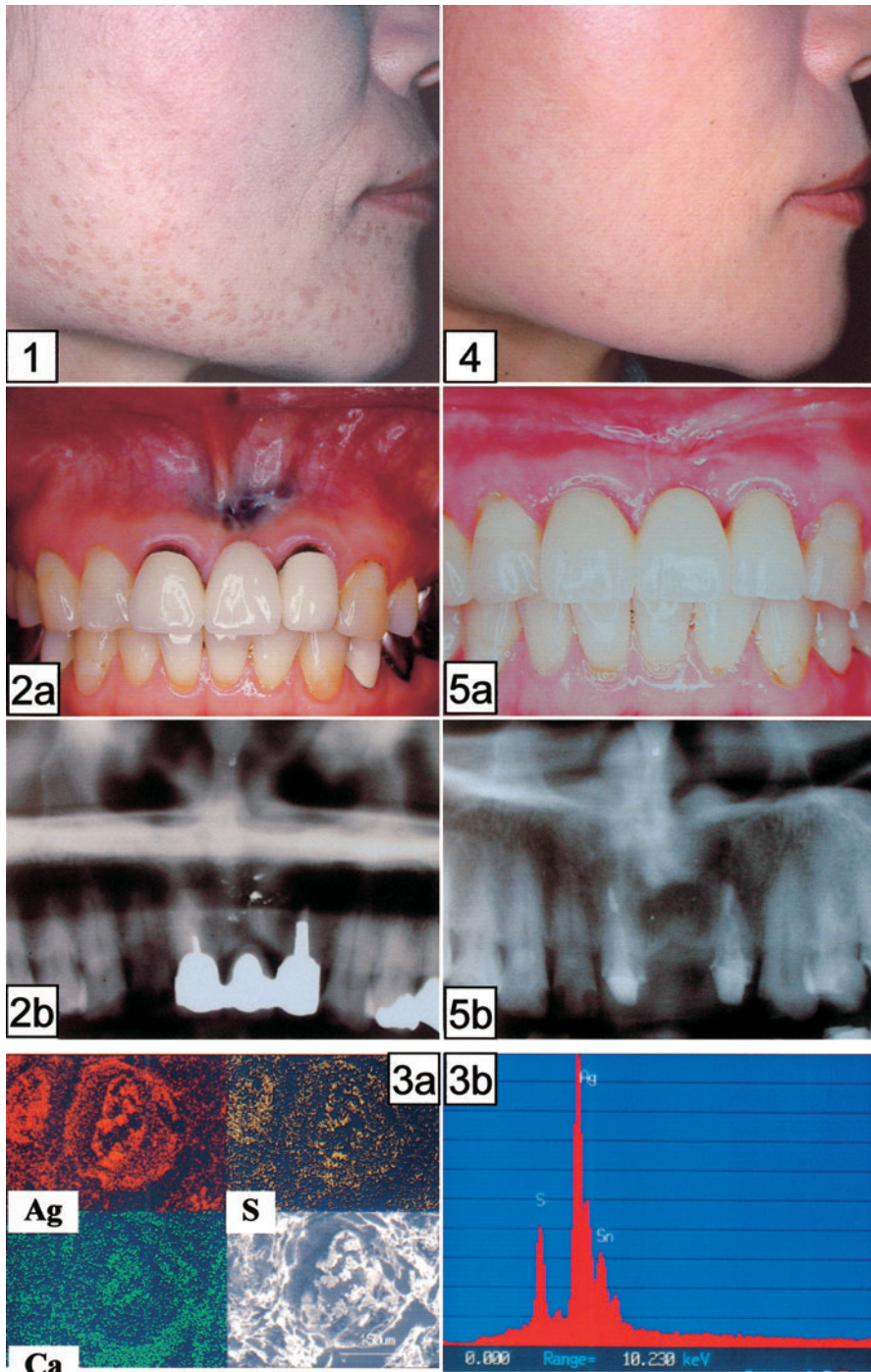


Fig. 1 Facial configuration at initial visit

Fig. 2 Intraoral picture (2a) and orthopantomograph (2b) at initial visit

Fig. 3 Analysis (3a) and quantitative analysis (3b) of dissected material

Fig. 4 Facial configuration 17 months after removal operation

Fig. 5 Intraoral picture (5a) and orthopantomograph (5b) 9 months after removal operation

that, although a few foreign materials still remained in the alveolar bone and nasal septum, the bulk of foreign materials had been removed. Furthermore, all dental restorative materials were completely removed, and fibre (Fibrekor, Jenerick/Pentron, Japan) and hybrid materials were used to create a crown prosthesis. In the photograph of the oral condition, although a scar can be seen, there is no black discoloration of the gingiva. At 10 months after the removal operation, facial symptoms had improved.

### Discussion

Humans need trace elements to survive, and such metals are used not only as accessories, but also as alternatives in the medical field<sup>7</sup>. Although many kinds of metal-based material are widely used in the field of dentistry, alloy metals, which do not normally have adverse effects, sometimes affect the physical condition or constitution of the patient. Symptoms are individual with variable reactions to metal allergies, for example eczema, lichen planus, palmoplantar pustulosis, etc.

Reverse root-end sealings have been carried out with amalgams, resins, calcium phosphates, etc.<sup>1</sup>. There are many reports that amalgams are convenient for sealing off root-ends and have a favorable clinical course<sup>2,3,8,13</sup>. However, amalgams, which were the most popular materials in the 1960's, rarely cause allergic reactions strong enough to alter a patient's constitution more than 30 years after reverse root-end sealing. Therefore, this case is believed to be a rare exception. Tsurumachi *et al.* reported the risk of spillover of an amalgam element<sup>13</sup>, and Alhadainy *et al.* showed that amalgam root-end sealing did not guarantee root-end sealing by the cementum<sup>1</sup>. Although there might be no symptoms of allergy to metals, a long term follow-up is necessary to prevent allergy crisis and subsequent alteration of the patient's constitution. Although there is insufficient evidence to show that the facial eczematous symptoms in

this case were directly a result of amalgam-like metal being left over in the maxillary incisor area, we believe that this material was certainly one of the factors behind the eczematous symptoms that the patient experienced. Metal allergy is a delayed hypersensitivity, where an allergy develops from ionized metal interacting with protein in the body. It is suggested that metals remaining inside the body, such as dental implants and sealing materials for reverse root-ends or perforations, evoke symptoms in patients with metal allergies, rather than the crown restoration itself. In this particular case, the results of the patch test and the componential analysis suggest that tin was the allergen for the patient's cutaneous symptoms. There are some reports suggesting allergic contact dermatitis to be a tin allergy<sup>11,12</sup>. Furthermore, in this case, the patient also had an allergy to foods which contained zinc, such as oysters and shrimp. Therefore, dentists should be careful to question patients about food allergies.

The physical condition and constitution of patients change continually. Materials used in the past affect the body several decades after the metal implantation. Therefore, when dentists apply metal materials in the body, they need to appreciate that such operations must be done correctly<sup>5,6,9,11</sup>. Dentists must treat patients with an accurate understanding of the materials to be used and the changing constitution of each patient.

### Acknowledgement

The authors wish to thank Dr. Yoko Suzuki for the physical data on the patient, and also the patient who allowed this report on their dental and medical development to be made.

### References

- 1) Alhadainy HA, Himel VT (1993) Evaluation of the sealing ability of amalgam, cavit, and glass ionomer cement in the repair of furcation perforations. *Oral Surg Oral Med Oral Pathol*

- 75:362–366.
- 2) Benenati FW, Roane JB, Biggs JT, Simon JG (1986) Recall evaluation of iatrogenetic root perforations repaired with amalgam and gutta-percha. *J Endod* 12:161–166.
  - 3) ELDeeb ME, ELDeeb M, Tabibi A, Jensen JR (1982) An evaluation of the use of amalgam, cavit, and perforations. *J Endod* 8:459–466.
  - 4) Hasegawa Y, Sugaya T, Kawanami M (2004) Effectiveness of root-end sealing 4-META/MMA TBB resin on healing of apical periodontitis. *Japanese J Conserv Dent* 47:622–632. (in Japanese)
  - 5) Inoue T, Hata N, Saito J, Shimono M (2000) Discussion of dental implant and metal allergy. *Nihon Shikwa Hyoron* 689:101–110. (in Japanese)
  - 6) Inoue T, Matsuzaka K (2003) Oral Symptom and Specialized Test, Clinical Examination at the Chair Side, 1st ed., pp.27–43, Dental Diamond, Tokyo. (in Japanese)
  - 7) Inoue T, Morimoto T (2004) Clinical examination, diagnosis and treatment for metal allergy in oral area. *Allergy Clinic* 18:449–459. (in Japanese)
  - 8) Kudo J (1989) A study on the treatment of the furcation perforation using germfree rat. *Japanese J Conserv Dent* 32:201–213. (in Japanese)
  - 9) Morimoto M (2003) Objective diagnosis of dental metal allergy-induced lymphocyte stimulation test and patch test using erythema index by Mexameter. *Shikwa Gakuho* 103:145–155. (in Japanese)
  - 10) Nakayama A, Ogiso B, Tanabe N, Takeichi O, Matsuzaka K, Inoue T (2005) Behaviour of bone marrow osteoblast-like cells on mineral trioxide aggregate: morphology and expression of type I collagen and bone related protein mRNAs. *Int Endodontic J* 38:203–210.
  - 11) Namikoshi T, Yoshimatsu T, Suga K, Fujii H, Yasuda K (1990) The prevalence of sensitivity to constituents of dental alloys. *J Oral Rehabil* 17:377–381.
  - 12) Nielsen NH, Skov L (1998) Occupational allergic contact dermatitis in a patient with a positive patch test to tin. *Contact Dermatitis* 39:99–100.
  - 13) Tsurumachi T, Kurokawa T, Takita T, Miyata H, Ogiso B (2003) Long-term observation of root perforations repaired with amalgam. *Japanese J Conserv Dent* 46:619–625. (in Japanese)

*Reprint requests to:*

Dr. Kenichi Matsuzaka  
 Department of Clinical Pathophysiology,  
 Tokyo Dental College,  
 1-2-2 Masago, Mihama-ku,  
 Chiba 261-8502, Japan  
 Tel: +81-43-270-3582  
 Fax: +81-43-270-3583  
 E-mail: matsuzak@tdc.ac.jp