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Case Report

Long-term Observation of Porous Sapphire Dental Implants

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Abstract

We used porous sapphire dental implants made of alumina clinically for 4 years 1 month, commencing September, 1984 until September, 1988. Subjects consisted of 18 men and 42 women 20–71 years old (mean age: 35 years). Sixty-five implants were inserted in 60 patients. Of these, 20 were clinical cases of an implant connected with natural teeth and 45 were free-standing cases. We conducted a follow-up study on these patients over a 23-year period. One implant in 1 patient had to be removed because of postoperative infection and 8 implants in 7 patients had to be removed because of fracturing or detachment of the porous-part. This paper reports 3 cases where implants remained in place for 21–23 years. These cases have all shown good long-term clinical progress.

Key words: Dental implant—Porous—Alumina—Long-term observation—Clinical prognosis

Introduction

Removable partial dentures have been used frequently in free-end defective and intermediate, multiple-tooth defective cases. However, recently, various types of implant have grown in popularity due to marked improvements in biomaterials1. As a result, fixed prostheses supported by implants are increasingly being used for occlusal recovery instead of removable partial dentures. We clinically applied porous sapphire dental implants in which alumina was used as the base material, these were firmly interlocked with the bone (histological findings in the porous sapphire dental implant root area showed new bone growth into pore space)2 in the period spanning 1984–1988, and observed their clinical course over an approximately 23-year period. In this paper, we report 3 cases of implants
which have shown good clinical courses for 21–23 years following surgery.

Case Report

Sixty-five porous sapphire dental implants with alumina as the base material were inserted in 60 patients over a 4-year 1-month period between 1984 and 1988. The patients (18 men and 42 women) underwent surgery between the ages of 20–71 years (mean age: 35 years). Thirty-one implants were inserted in the maxilla (19 in anterior tooth area, 7 in premolar area, and 5 in molar area), and 34 implants were inserted in the mandible (12 in premolar area and 22 in molar area), excluding the mandibular anterior tooth area. Using implant superstructures, implants were connected with another implant or implants in 45 cases, and implants were connected with natural teeth in 20 cases. Implant superstructures were cemented to implants and natural teeth using dental cement in all cases. Nine implants in 8 patients were removed for the following reasons: one implant in one patient was removed due to infection in the bone surrounding the implant after prosthesis insertion (single use of an implant); eight implants in 7 patients were removed due to implant fracture or detachment of the porous area after single use of an implant in 3 patients (3 implants), and connective use of implants with natural teeth in 4 patients (5 implants).

From among these cases, we evaluated 3 (4 implants with natural teeth in 3 women) in which the clinical course was observed over a 21–23-year period. These comprised one with a maxillary molar area implantation (1 implant connected with natural teeth); one where alveolar bone augmentation with apatite blocks in the maxillary anterior tooth area was followed by implant insertion penetrating the apatite blocks (2 implants connected with natural teeth); and one where apatite granules were applied to the maxillary...
anterior tooth area (1 implant connected with natural teeth).

**Observations**

**Case 1: Maxillary molar connection case**

The patient was 33 years old at the time of surgery, and visited our department in November 1984 with the chief complaint of masticatory disorder due to absence of the maxillary left first and second molars. One implant was inserted in the maxillary left second molar area in December 1984. In April 1985, using the implant and first and second premolars as abutments, a bridge comprising porcelain fused to metal crowns and platinum-added gold alloy crown and pontic was cemented using polycarboxylate cement to connect the abutments. Figure 1 shows intraoral photographs (mirror-reflected images) and dental X-ray images obtained at 4 months after surgery. Figure 2 shows intra-oral photographs (mirror-reflected images) and dental X-ray images obtained at 22 years 6 months after surgery. Although slight bone resorption and gingival recession were noted in the natural teeth, neither implant mobility nor alveolar mucosal redness or swelling around the implant was detected, showing a good clinical course.

**Case 2: Maxillary anterior tooth connection case**

The patient was 42 years old at the time of surgery, and visited our department in July 1984 with the chief complaints of mobility, redness, swelling, and drainage in the bilateral maxillary central and lateral incisors. After extracting the bilateral maxillary central and
lateral incisors for periodontal disease, socket curettage and orthopedic surgery of the alveolar ridge were performed. Thereafter, apatite blocks were condensed in the bone defective area, and preservation treatment of the alveolar ridge was performed. In January 1985, implants were inserted in the bilateral maxillary central incisor areas, penetrating the apatite blocks. In June 1985, using the implants and bilateral maxillary canines as abutments, a bridge consisting of porcelain fused to metal crowns was cemented using polycarboxylate cement to connect the abutments. Figure 3 shows intra-oral photographs and dental X-ray images obtained at 8 months after surgery. Figure 4 shows intra-oral photographs and dental X-ray images obtained at 22 years 2 months after surgery. Neither resorption of the condensed apatite blocks nor implant mobility was present. No alveolar mucosal redness or swelling was noted around the implants, showing a good clinical course.

**Case 3: Maxillary anterior tooth connection case in which apatite granules were applied**

The patient was 32 years old at the time of surgery, and visited our department in January 1986 with the chief complaints of mobility, redness, and swelling in the maxillary right central incisor. After extracting the maxillary incisor for periodontal disease, socket curettage, implantation (one implant was inserted in the maxillary right central incisor areas), and condensation of apatite granules were performed. In August 1986, using the implant, maxillary right lateral incisor, and maxillary left central incisor as abutments, a three-connected-crown consisting of porcelain fused to metal crowns was cemented, using polycarboxylate cement to connect the abutments. Figure 5 shows intra-oral photographs and
dental X-ray images obtained at 1 year and 2 months after surgery. Figure 6 shows intraoral photographs and dental X-ray images obtained at 20 years and 9 months after surgery. Neither resorption of the condensedapatite granules nor implant mobility was found. No alveolar mucosal redness or swelling was detected around the implants, showing a good clinical course.

Discussion

It was hypothesized that the long-term clinical prognosis of porous sapphire dental implants would be better than that of the usual type of sapphire dental implant. In terms of which factors might influence the long-term prognosis of an implant, clinicians should take into consideration selection of indications, performance of appropriate surgical procedures, treatment guidelines with regard to occlusal force, and prosthetic design. In current implant therapy, prosthetic treatment is performed without connecting implants with natural teeth, since they show different compression levels with pressure application. Furthermore, although the use of apatite blocks and granules after removing infectious lesions around tooth roots had frequently been applied to preserve the alveolar bone and retain the alveolar ridge in the former half of the 1980s, it is not currently being used because many poor prognosis cases occurred.

To retain implants with a favorable, long-term clinical course, not only intra-oral hygienic control by patients themselves, but also regular control of occlusal changes by clinicians is important.

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