Implant-Prosthetic Treatment in HIV-infected Patients Receiving Highly Active Antiretroviral Therapy: Report of Cases

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Purpose: *Since 1997, the use of highly active antiretroviral therapy (HAART) has significantly improved systemic health and life expectancy of patients who test positive for the human immunodeficiency virus (HIV) in industrialized countries. Therefore, although implant-supported prosthetic rehabilitation has been restricted to immunocompetent individuals, it may be considered for these patients.* ***Case Reports:*** *The treatment course of implant-prosthetic rehabilitation in 3 patients is reported. Patient 1 (male, age 64 years) was under 4-drug therapy; patient 2 (male, age 38 years) and patient 3 (female, age 49 years) were under 3-drug therapy. Two patients had suffered from AIDS-defining diseases prior to HAART. Oral manifestations of HIV infection were not diagnosed throughout the observation period. Patients had CD4$^+$ cell counts between 250 and 800/mL, and viral load was below 50/mL. Perioperative antibiotic treatment was not applied. Two patients presented with edentulous mandibles. In the third patient, single-tooth replacement of both mandibular first molars was performed. A total of 10 Frialit-2 implants were placed without augmentation procedures.* ***Results:*** *One implant failed after 3 months and was successfully replaced. Two patients received magnet-retained overdentures in the mandible, and 1 patient was treated with single crowns. All implants and restorations are successfully in function. Neither radiographic nor clinical signs of inflammation were detected during the observation period (range, 7 to 32 months).* ***Conclusions:*** *The outcomes of the 3 patients suggest that immunologically stable HIV-positive patients on HAART may be considered for implant-prosthetic rehabilitation.* Int J Oral Maxillofac Implants 2006;21:951–956

Key words: *dental implants, HIV-positive patients, highly active antiretroviral therapy, immunocompromised patients, implant-supported prosthetic rehabilitation*

Scientific evidence of increased risks during invasive dental treatment procedures in patients who are immunosuppressed or who test positive for the human immunodeficiency virus (HIV) is limited.[1–3] Studies on treatment courses in oral surgery after the introduction of highly active antiretroviral therapy (HAART) are not yet available. Formerly, implant-prosthetic oral rehabilitation was restricted to immunocompetent individuals. Clinicians declined to proceed with implant treatment in immunocompromised patients, for these patients are generally predisposed to opportunistic infections.

Since 1997, the use of HAART has significantly improved the systemic health and life expectancy of HIV-positive patients. In particular, reduction of HIV-associated opportunistic infections, suppression of plasma HI-viral load, elevation of CD4+ lymphocyte cell counts, and subsequently, improved immune status have been reported.[4] In addition, a significant decline in oral opportunistic infections and other HIV-associated oral lesions has been detected.[5–7] Therefore, in this group of patients not only extended periodontal prophylaxis, periodontal therapy, and conventional restorative dentistry but also dental implant treatment may be considered to improve quality of life.

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Table 1 Synopsis of Medical Conditions and History

	Patient 1	Patient 2	Patient 3
Age (y)	64	38	49
Gender	M	M	F
Year diagnosed as HIV+	1989	1996	1993
CD4+ cells (/μL)	408	800	576
Viral load (/mL)	< 50	< 50	< 50
History of AIDS-defining diseases	B-cell lymphoma Cytomegalovirus Infection of epiglottis	—	Candida esophagitis
Oral manifestations of HIV	—	—	—
HAART at the time of surgery	4-fold: didanosine, saquinavir, ritonavir, nevirapine	3-fold: abacavir, lamivudine, zidovudine	3-fold: abacavir, lamivudine, lopinavir
Year patient began HAART	1998	2000	1999

The purpose of these case reports was to present implant-prosthetic treatment focusing on the immune status of HIV-positive patients undergoing HAART.

CASE REPORTS

Three known HIV-positive patients who had been followed up for at least 3 years required prosthetic treatment. Two were completely edentulous and asked for mandibular complete dentures supported by implants; they were satisfied with the function of their maxillary complete dentures. One patient asked for the single tooth replacement of both mandibular first molars, which had been removed years ago.

The patients' physicians were consulted regarding their immunologic status (Table 1). All patients were under HIV combination therapy and had been compliant for a minimum of 4 years. They were thoroughly informed about treatment options and courses as well as consequences of possible complications and the specific risks of invasive surgical treatment considering their HIV-positive status.

Written informed consent was given by all the patients. CD4+ cell count, HIV viral load, and blood clotting function parameters, including thrombocyte count, were documented in each patient prior to decision making and treatment planning.

Case 1

Patient 1 presented for stabilization of the mandibular complete denture with dental implants in April 2001. Immunologic data and HIV therapy for the patient are shown in Table 1. After thorough treatment planning, 4 Frialit-2 screw-type implants (Dentsply Friadent, Mannheim, Germany) were placed in the interforaminal region of the mandible in November 2001. Healing was uneventful. Four months later healing abutments were connected. One implant (position of the mandibular right first premolar) revealed lack of osseointegration and was removed. The other implants were fully integrated. Osseointegration was confirmed by the exclusion of implant mobility, the use of a percussion test, and lack of vertical or peri-implant radiographic translucency. Prosthetic treatment was completed by stabilizing the mandibular overdenture with Titanmagnetics (Steco-Systemtechnik, Hamburg, Germany) in March 2002. One Frialit-2 screw-type implant was placed in the position of the mandibular first right premolar in April 2003 and was used to retain the overdenture after a 6-month unloaded healing period. The last follow-up in May 2004 revealed neither radiologic nor clinical signs of inflammation (Figs 1a to 1d), and the patient remained completely satisfied.

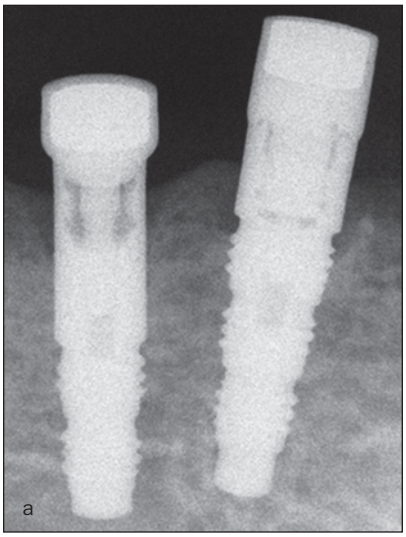
Case 2

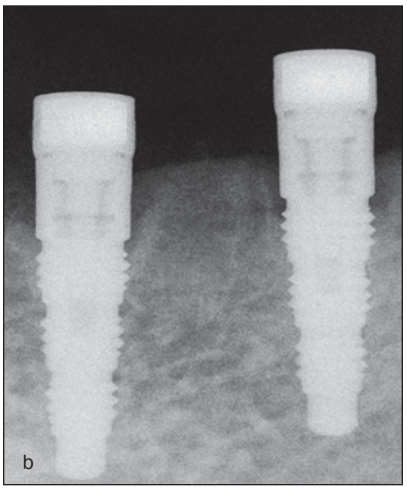
Patient 2 asked for the single-tooth replacement of both mandibular first molars, which had been removed years ago. Table 1 shows baseline data and mode of HIV therapy of the patient. Following treatment planning, the patient received a single Frialit-2 screw-type implant in January 2002. The patient received a second implant in October 2002. The unloaded healing period was uneventful. Second-stage surgery, abutment connection, and prosthetic treatment with cemented single crowns were performed after 4 and 6 months, respectively. The last follow-up in May 2004 revealed neither radiologic nor clinical signs of inflammation (Figs 2 a to 2d), and the patient remained satisfied.

Case 3

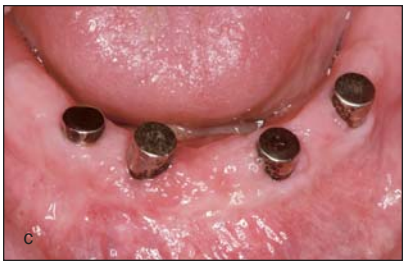
Patient 3 presented in December 2003 for implant stabilization of a mandibular complete denture. Immunologic data are recorded in Table 1. After thor-

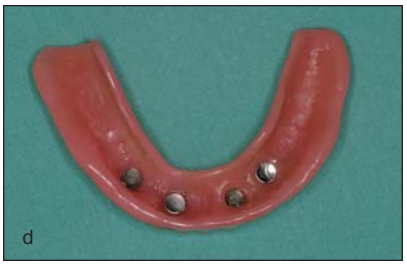
Figs 1a and 1b Intraoral radiographs of *(a)* the left implants and magnetic fasteners and *(b)* the right implants and fasteners in patient 1. Marginal bone resorption after at least 18 months of loading did not exceed 3 mm for 16-mm-long implants.



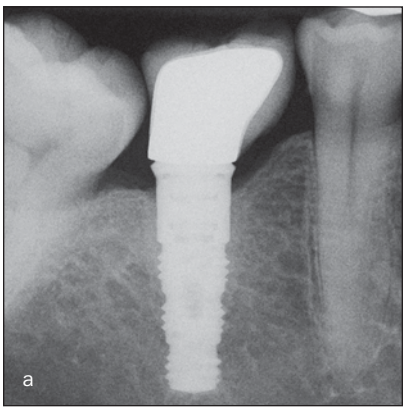


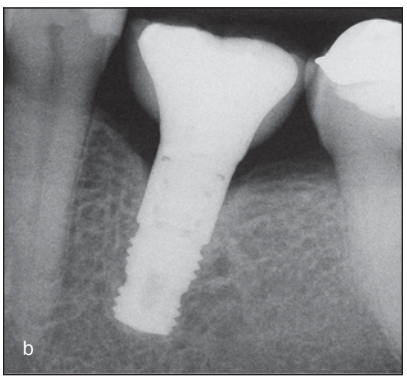
Figs 1c and 1d Clinical views of the magnetic fasteners attached to the implants and mandibular overdenture. No symptoms of inflammation have been detected.



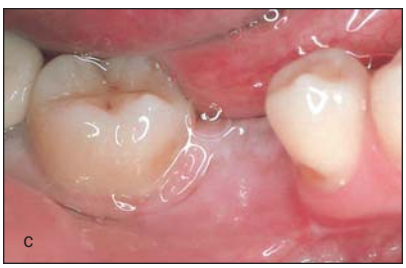


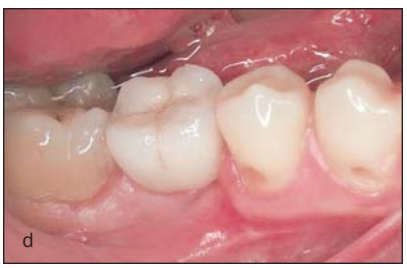
Figs 2a and 2b Intraoral radiographs *(a)* 20 and *(b)* 27 months postimplantation for patient 2. Marginal bone resorption did not exceed 2 mm.

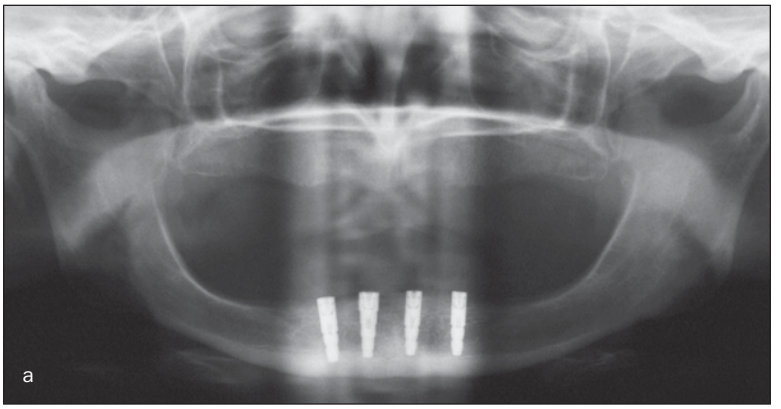


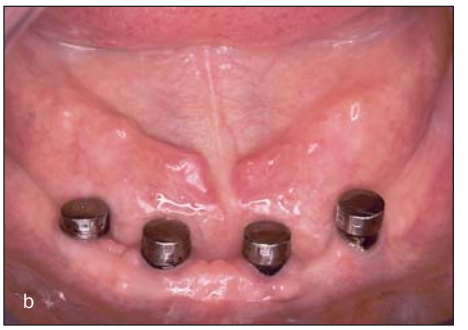


Figs 2c and 2d Clinical view of the mandibular right first molar region *(c)* preoperatively and *(d)* 20 months postimplantation.









Figs 3a and 3b *(a)* Panoramic radiograph of patient 3 following 4 months of unloaded healing period, prior to second-stage surgery. Neither peri-implant translucency nor vertical bone loss could be detected. *(b)* Clinical view of the magnetic fasteners fixed on the implants after 1 year of loading. No symptoms of inflammation have been detected. No implant loosening, pain, increased sulcus depth, or sulcus bleeding were detected clinically.

ough treatment planning, 4 Frialit-2 screw-type implants were placed in March 2004. A local postoperative mucosal dehiscence adjacent to the implant site at the position of the mandibular left first premolar was successfully treated with the application of topical chlorhexidine (0.2%). Healing abutment connection was performed after an unloaded healing period of 4 months. Neither radiologic signs of peri-implant bone loss nor clinical signs of inflammation have been detected (Figs 3a and b). Prosthetic treatment with an overdenture stabilized with Titan-magnetics was completed in October 2004. The last follow-up in April 2006 revealed no changes in peri-implant conditions, indicating a stable treatment result. The patient remained completely satisfied.

All patients were treated using local anesthesia on an outpatient basis. Before surgery, patients were asked to rinse their mouth with chlorhexidine for 1 minute. Since augmentation procedures were not necessary, a perioperative antibiotic treatment was not applied. Patients received the following postoperative medication: 600 mg ibuprofen 3 times daily for postoperative pain control; chlorhexidine 0.2% mouth rinse twice a day. The sutures were removed after 7 to 10 days. For the edentulous patients, soft relining of the mandibular denture was performed 10 days postoperatively with a cold-curing reliner (Molloseal; Detax, Ettlingen, Germany). Postoperative follow-up was carried out on a monthly basis.

Follow-up and maintenance examinations were provided at 3- to 4-month intervals during the prosthetic loading phase. No clinical signs of oral opportunistic infections associated with HIV infection were found during the observation period (range, 7 to 32 months).

DISCUSSION

Implant-prosthetic rehabilitation has been proven to be a predictable treatment method with high success rates.[8–10] It enhances patient satisfaction in terms of chewing ability, stability, comfort, esthetics, and speech.[11,12]

The introduction of HAART for HIV-infected patients has significantly postponed the outbreak of AIDS-defining diseases, reduced the rates of opportunistic infections and oral HIV-associated lesions significantly, and enhanced life expectancy.[5,6,13,14] In these case reports, patients received a combined therapy of nucleoside reverse transcriptase inhibitors, nonnucleoside reverse transcriptase inhibitors, and/or protease inhibitors. One patient required additional drug substitution therapy with levomethadone.

Since the general health status and longevity of HIV-positive patients has been improved by HAART, adequate prosthetic treatment may be essential. In HIV-positive patients with a stable and adequate immune status, dental implant treatment be may be indicated so as to improve life quality.

Case reports on treatment courses and results of invasive treatment with dental implants in HIV-positive and immunosuppressed patients are sparse.[2,15] A single case report presented the treatment course of a single implant placed immediately postextraction in an immunologically stable HIV-positive patient; the implant remained successful after an observation period of 18 months.[2] In another case report, results after a 10-year follow-up of an edentulous immunosuppressed patient following liver transplantation with a successful outcome were documented.[15] Both case reports supported the hypoth-

esis that implant-prosthetic rehabilitation of immunocompromised but immunologically stable patients can be a predictable treatment option. These findings have been supported by the case reports presented here.

Special attention must be paid to close follow-up intervals to rule out inflammatory reactions of the peri-implant tissues as well as HIV-associated oral lesions. Therefore, a high compliance level of the patients is 1 of the prerequisites for dental implant therapy. Regular recall examinations are necessary for the detection of HPV-induced lesions, since some findings have indicated that in some patients the immunological effects of HAART may not provide sufficient protection against such lesions.

Studies on peri-implant inflammatory lesions in humans have indicated that enhanced $CD3^+$ and $CD4^+$ T-cell levels were found in peri-implant mucositis,[16,17] whereas in peri-implantitis which is characterized by bone loss, $CD19^+$ B-cells were found in large numbers.[16] Therefore, early detection of ongoing peri-implant mucositis appears to be mandatory, as in CD4+ cell depression a cell-mediated barrier function against microbial infection of peri-implant tissue is expected to be diminished. Besides regular determination of $CD4^+$ and T-cell count and HIV-viral load, noninvasive local examination methods for the detection of early-stage inflammatory response prior to ongoing peri-implant attachment and bone loss should be considered. In addition to regular clinical investigations of the oral health status, the sulcus fluid flow rate and β-glucuronidase levels, which are early markers of attachment loss with high predictive values in periodontitis,[18] peri-implant mucositis, and peri-implantitis[19] (although not yet applied for prediction of the latter 2 conditions), should be taken into consideration.

Provided that the immune status of the patient is stable, no modification of routine dental treatment in HIV-positive patients is recommended. Optimized oral hygiene, regular recall intervals, screening for HIV-associated oral lesions, and detection of xerostomia as a possible side effect of HAART are advocated as a preventive approach.[20] Dental treatment in immunocompromised patients should be carried out with precautions; the clinician must keep in mind the patient's reduced $CD4^+$ cell counts, reduced thrombocytes, and neutrophils and his or her AIDS status.[20] Moreover, additional attention should be paid to postoperative infection and prolonged hemorrhage. Close consultation with the primary care provider, monitoring of immune status, and blood clotting parameters, as well as close recall intervals, are absolutely necessary.

CONCLUSIONS

Planning of implant-prosthetic rehabilitation in HIV-positive patients depends on critical consideration of general health status and appropriate adherence to HAART.

Dental implant treatment in HIV-positive patients with $CD4^+$ cell counts > 250/μL and viral load below the lower limit of detection seems to provide predictable results after unloaded healing periods of at least 4 months.

The clinical outcome and patient satisfaction showed that immunologically stable HIV-positive patients may be considered candidates for dental implants. Close collaboration with the patient's primary care provider is essential.

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