Implants in an HIV-positive Patient: A Case Report

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Human immunodeficiency virus (HIV) causes an immune incompetence that weakens the body's defense against pathogens. It has been supposed that HIV-positive patients are more likely to develop both early and late postoperative complications, such as septicemia and poor wound healing. This has not been corroborated by more recent studies but seems to depend on the patient's level of CD4 cells and his or her general condition. As the life expectancy of HIV-positive individuals increases and the condition becomes increasingly controllable, esthetic dental treatment becomes more significant and implant-supported prostheses may be considered as an alternative to removable dentures. Except for a single case report on the immediate placement of a single-tooth implant, no reports are available on implant dentistry in HIV-positive patients. This case report concerns implant placement in the maxilla and mandible of an HIV-positive individual and complete dental and implant rehabilitation. Two years after implant placement, the prosthesis is functioning well. INT J ORAL MAXILLOFACIAL IMPLANTS 2004; 19:425–430

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Human immunoeficiency virus (HIV) is a retrovirus identified in 1983. It causes immune incompetence, weakening the body's defenses against pathogens. It is estimated that 1.5 million people in the industrialized countries of Western Europe and North America are infected with HIV.[1]

The course taken by HIV may vary. The disease progresses through several stages:

1. Primary infection. Shortly after the onset of infection, the virus tends to proliferate vehemently and cause flulike symptoms.
2. Asymptomatic stage. This stage may last for months or even years.
3. Secondary proliferative stage (general symptomatic stage). In this stage, the immune system is damaged. As a result, general symptoms such as lymph node enlargement, night sweats, and diarrhea occur.
4. Acquired immunodeficiency syndrome (AIDS). Eventually immune deficiency causes severe conditions or HIV-associated cancers such as Kaposi's sarcoma, Hodgkin's and non-Hodgkin's lymphoma,[2] and cervical cancer.

Oral manifestations include oral candidiasis, hairy cell leukemia, HIV-associated gingivitis (including necrotizing and ulcerative gingivitis), and HIV-associated periodontitis.[3] Atypical ulcerations and an increased incidence of herpetic infections have also been reported.[4]

Treatment is directed at suppressing the spread of HIV in the body by inhibiting the function of certain viral enzymes. Two main groups of inhibitors have been distinguished: reverse transcriptase inhibitors and antiproteases. Scientific evidence shows that the virus rapidly becomes resistant to a single inhibitor.[5] The development of resistance can, however, be halted by the combined administration of the

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inhibitors. The most common combination consists of 2 nucleoside analogs from the reverse transcriptase inhibitor group and an antiprotease. This combination has been shown to reduce the viral load, ie, the plasma virus count, beyond the detectable limit in many patients for some time and thus increase the patients' life expectancy substantially.[6] Despite the advances made in treatment, care should be taken to prevent infection, as well as stress, which further compromises the immune system.

Considering the dangers infection and stress pose to HIV patients, the effects of surgery on HIV-positive individuals were investigated. Most of the published studies revolved around major chest and abdominal interventions and around orthopedic procedures. They showed that patients are more likely to develop both early and late postoperative complications such as septicemia and poor wound healing, and that the course of the primary condition is often accelerated.[7]

In earlier studies AIDS patients were also found to carry an increased mortality risk after major surgery.[8] However, this has not been corroborated by more recent studies.[9] The rate of complications was reported to be slightly increased in symptomatic HIV-positive individuals and AIDS patients.[10]

These observations concur with studies of patients undergoing dental surgery. In 3 of 4 studies there was no significant difference between the rate of complications following tooth extractions for HIV-positive patients and the rate for healthy individuals. But on closer analysis, pronounced immunosuppression (CD4+ T cells < 200/mL) and severe neutropenia (neutrophilic leukocytes $< 500/mm^2$) were found to be associated with a higher risk of postoperative complications.[11]

As the life expectancy of HIV-positive individuals increases and the condition becomes increasingly controllable, implant-supported prostheses may be considered as an alternative to removable dentures in HIV-positive individuals, provided that they are generally in good physical condition and have no oral manifestations of the disease.

Except for a single case report on the immediate placement of a single-tooth implant, no reports are available on implant dentistry in HIV-positive patients.[12] While the risk of early postoperative complications should be comparable to that after tooth extractions, compromised immunity might be associated with an increased risk of peri-implant infection. More experimental and clinical studies are needed to shed light on this matter.

This case report concerns implant placement in both the maxilla and the mandible of an HIV-positive individual.

CASE REPORT

In 1986 the patient, then 27 years old, was diagnosed with HIV. She had become infected in the course of her heroin addiction. Since 1988 she has been in treatment at the Department of Dermatology, University of Vienna Medical School, and is enrolled in a methadone program. Hepatitis C, also related to her dependence on heroin, was detected in 1980 and hepatitis B in 1983. During the course of her HIV infection the patient has developed oral and vulvovaginal candidiasis, recurrent pneumonia, *Pneumocystis carinii* pneumonia, and several herpetic infections. Several treatment modalities have been tried. Since June 1999, the patient has been on a 4-drug regimen with successful and sustained reduction of the virus load. The regimen consists of 400 mg didanosine (Videx; Bristol-Myers-Squibb, New York, NY), 80 mg stavudine (Zerit; Bristol-Myers-Squibb), 600 mg efavirenz (Stocrin; Merck Sharp & Dohme, Haarlem, The Netherlands), and 300 mg lamivudine (Epivir; Glaxosmithkline, Münich, Germany).

She first came to the Department of Oral Surgery, Vienna University School of Dentistry, in 2000 for rehabilitation of her poor dentition with nonremovable dentures. An implant-supported prosthesis was considered the only treatment option. It would have been impossible to restore the maxillay with a tooth-supported restoration, and such a restoration might have jeopardized the gingival tissue in the mandible.

Local Findings

Intraoral examination showed natural teeth from the maxillary right canine to the second left premolar and from the left canine to the right first premolar in the mandible (Fig 1). In the maxillary right quadrant the root of the second premolar was visible. All of these teeth, except the root on the right side and the 2 premolars on the left, had been reduced to carry a cantilevered prosthesis with 3 maxillary pontics (1 canine, 2 premolar) and 5 mandibular premolar pontics (2 on one side, 3 on the other). The maxillary right canine was devitalized and showed pronounced caries lesions. The maxillary right central incisor and the left lateral incisor had been treated endodontically. The cast post of the central incisor had caused buccal gingival tattooing. Orthopantomography showed endodontic overfilling of this tooth. The patient's oral hygiene was excellent and the periodontal tissue appeared normal.

Using computerized tomography with orthoradial reconstruction (Figs 2 and 3), resorptive bone loss was diagnosed in the regions of the maxillary

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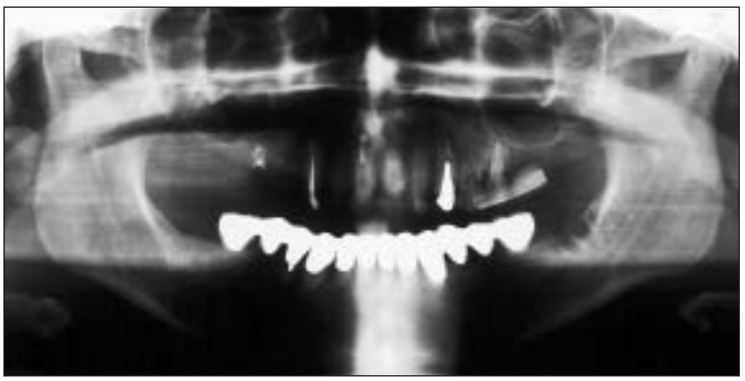
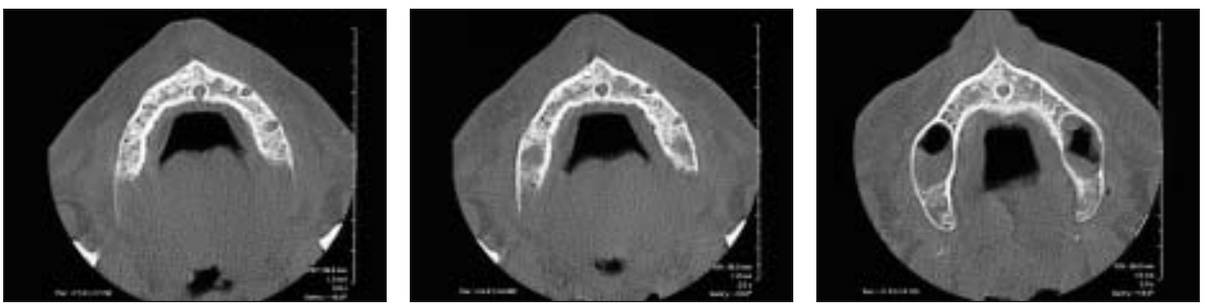
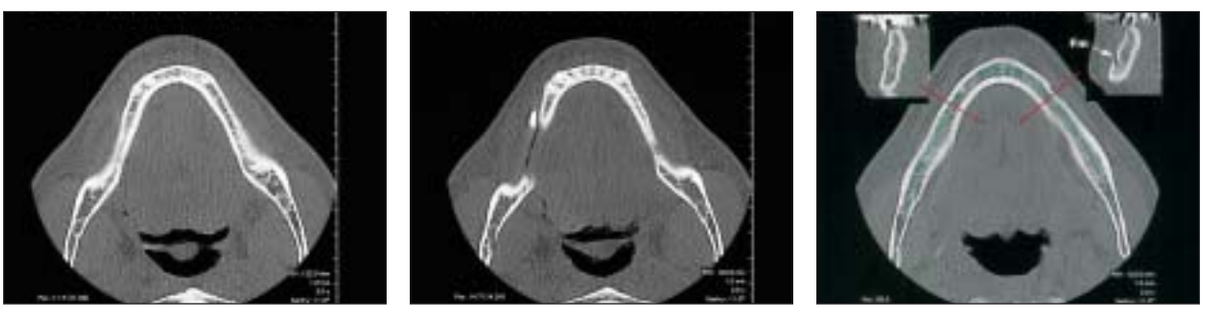


Fig 1 Orthopantomogram showing the initial clinical situation.



Figs 2a to 2c Computerized tomography of the maxilla with 3 representative slices of different levels.



Figs 3a to 3c Computerized tomography of the mandible with 3 representative slices of different levels. The 2 small illustrations at the top of *(c)* show the orthoradial reconstruction of the mandibular alveolar ridge, with the mental foramen (Fm) on the right.

first premolars (Cawood and Howell[13] class 3). Class 5 bone loss had occurred in the regions of the maxillary second premolars and class 6 in the regions distal to them; class 3 bone loss had occurred in the mandible. Bone quality (Lekholm and Zarb classification[14]) was type 2 to type 3 in the maxilla and type 3 in the mandible. The vertical bone volume was adequate; mandibular ridge augmentation was unnecessary.

General Condition

The CD4 cell count had consistently been between 200 and 440/μL. The last available count was 396/μL. The viral load had been below the detectable level (less than 50 copies/mL) consistently since July 1999. The patient had no signs of exacerbated AIDS. In view of these findings and the patient's excellent general condition, surgery and implant placement were approved by the attending physician.

Surgery

Both premolars on the left side and the root of the maxillary right second premolar were extracted immediately, and minimal surgery was planned. Augmentation procedures (ie, a sinus lift) were avoided by making the best possible use of the local host bone.

Two months before surgery the maxillary right canine was extracted because of moderate symptoms and poor prognosis. The material in the apical region of the overfilled maxillary right incisor was

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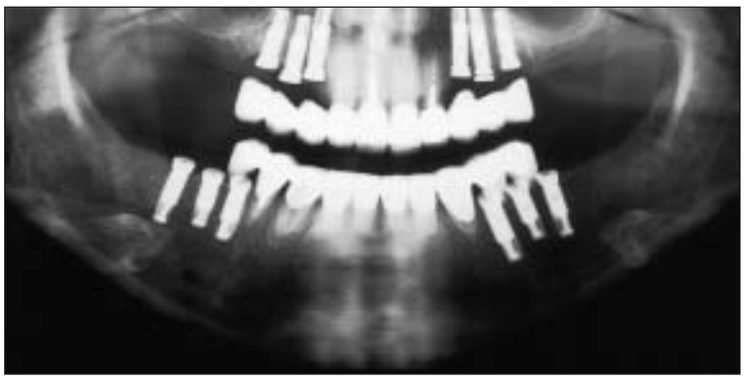

Fig 4 Orthopantomogram taken immediately after implantation.

Table 1 Implant Locations and Length (in mm)

Region	Length
Maxilla	
Right	
Canine	15
First premolar	13
Second premolar	11.5
Left	
Canine	15
First premolar	15
Second premolar	11.5
Mandible	
Right	
Second premolar	13
First molar	11.5
Second molar	13
Left	
First premolar	15
Second premolar	13
First molar	11.5

All implants were 3.75 mm in diameter.

removed. Because of the dense endodontic filling, no root resection was done. At this time HIV-related clinical symptoms were absent and the CD4 count was 394/μL.

In March 2001, 3 Brånemark implants (Nobel Biocare, Göteborg, Sweden) were placed under general anesthesia in each quadrant as recommended in the manufacturer's standard protocol. Details about the position, diameter, and length of each implant are given in Table 1. At a torque of up to 40 Ncm, primary stability was achieved for all implants. The 3 upper threads of the delayed immediate implant[15] placed in the position of the maxillary right canine had no direct bone contact (Fig 4).

Because the patient was known to be allergic to penicillin, 900 mg/d clindamycin (Dalacin C; Pharmacia & Upjohn, Stockholm, Sweden) was administered for antibiotic coverage during and after the surgery. After surgery, tramadol hydrochloride (Tramal; Grunenthal, Aachen, Germany) was administered intravenously for pain relief. After discharge, oral dexibuprofen (400 mg 3 times a day, Seractil forte; Gebro Pharma, Fieberbrunn, Austria) was prescribed.

The patient recovered from the surgery uneventfully and was provided with a temporary tooth-supported metal-ceramic prosthesis 6 days postoperatively.

Two months after implant placement, the patient's CD4 cell count dropped to 255/μL. This was substantially less than before implantation, but no clinical symptoms were experienced. The viral load continued to be below the detection level. Three months later the CD4 cell count increased again to 333/μL.

In October 2001, 7 months after the first operation, the implants were exposed. All of them were osseointegrated. Following the manufacturer's protocol, EsthetiCone abutments (Nobel Biocare) were connected to the implants at a torque of 20 Ncm.

Prosthodontic Treatment and Follow-up

Prosthodontic treatment was started 1 week after abutment connection. An implant-supported suprastructure was screwed onto 3 implants in each quadrant. In the left and right maxilla and in the left mandible, the restoration was cantilevered distally by the width of 1 premolar. Because the mandibular right first premolar was nonvital when the temporary restoration was removed, it was treated endodontically, and a cast post was inserted. During the same visit, the remaining natural teeth were covered with Procera crowns (Nobel Biocare).

At the follow-up visits 6, 12, and 24 months postrestoration, the implants, remaining natural teeth, and gingiva were in optimal condition. The patient was fully satisfied with both the esthetic and functional outcomes.

At the last follow-up visit, the peri-implant soft tissue was healthy and did not show signs of bleeding (Fig 5a). Probing depth mesial to the implant in

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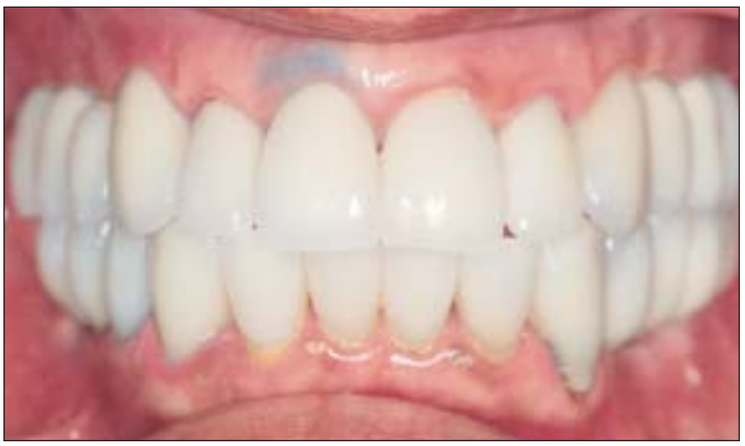

Fig 5a Intraoral photograph of the restoration 2 years after implant placement.

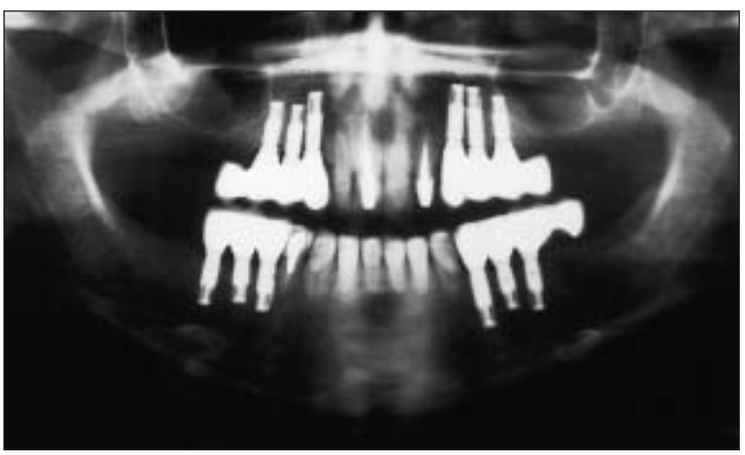

Fig 5b Orthopantomogram 2 years after implant placement.

the maxillary right canine region was 3 mm. Orthopantomography showed saucerization down to the fifth thread (Fig 5b). There was a slight gingival recession (2 mm) buccal to the implant in the mandibular right second premolar region. All implants were osseointegrated, with Periotest values below 0. The viral load at that time was still below the detectable level.

DISCUSSION

Dentistry for HIV-positive individuals has dramatically changed in the past few years. In the past the emphasis was on the relief of acute pain. But patients' longer life expectancies at a better quality of life has shifted care toward restorative and prosthodontic management. In the process, implants are being considered as a treatment option for HIV-positive individuals, although their feasibility has not yet been established by clinical and experimental evidence. Except for placement of a single-tooth implant,[12] no reports have been published concerning implant treatment of HIV-positive patients.

This case report is probably the first to describe the complete rehabilitation of a female patient infected with HIV as well as hepatitis B and C with restorations supported completely by implants. It appears to corroborate the hypothesis that minor surgery does not carry an increased risk for the HIV-positive patient, provided that the HIV-associated condition is well controlled. At any rate, this patient's blood count and general condition did not deteriorate in the immediate postoperative period except for a slight transient reduction in the CD4 cell count.

Both the soft and the hard tissues healed uneventfully. The mucosa was healthy throughout without any signs of inflammation. Two years postimplantation, peri-implant bone loss was minimal according to the guidelines for successful implants by Zarb and Albrektsson,[16] and signs of peri-implantitis were absent. The only bone defect was the one mesial to the implant in the maxillary right canine region, which was discernible at delayed immediate implantation,[15] during which fully submerged implant placement proved to be impossible. This defect did not show signs of progression.

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Like orthopedic implants, dental implants appear to be a viable treatment option for HIV-positive individuals.[10] Even major surgery has not been reported to be associated with an increased rate of complications.[17] In maxillofacial surgery Schmidt and coworkers[18] reported an increased number of bone infections after surgical treatment of mandibular fractures in asymptomatic HIV-positive patients, whereas Martínez-Gimeno and coworkers[19] did not find a statistical difference in postoperative infections after mandibular and midface fractures.

The postoperative reduction in CD4 cell counts seen in earlier studies was attributed to an inflammatory process at the site of surgery rather than the stress to which the patients were exposed. In this patient the minimal loss of CD4 cells, which did not have any effect on her general condition, may have been caused by an intraoral build-up of pathogens.

The surgeon and the operating room team can avoid HIV infection by wearing double gloves, water-impermeable surgical gowns, and an extra pair of sleeves.[20] Wearing an extra pair of gloves can result in a 60% to 80% decrease in inner glove perforation and visible contamination.[21]

Further prospective studies of implant-based oral surgery in HIV-positive individuals are needed before implants can routinely be offered to this patient population.

CONCLUSION

Dental implants may become an alternative treatment option for HIV-positive individuals, provided the general signs and symptoms of their disease are well controlled.

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