Immediate Load Fixed Full-Arch Prosthesis with Three Dental Implants in Complete Edentulous Lower Jaw on Human immunodeficiency Virus Positive Patient: 36 Months Follow-up a Case Report and Literature Review

João Ricardo Almeida Grossi¹, Kevelin Poliana Palma Rigo Thiesen², Tatiana Miranda Deliberador³, Allan Fernando Giovanini⁴, João César Zielak⁵

Contributors:
¹Invited Professor, Department of Implantology and Periodontics, College of Dentistry, Positivo University, Paraná, Brazil; ²Dentist, Department of Implantology and Periodontics, College of Dentistry, Positivo University, Paraná, Brazil; ³Professor, Department of Implantology and Periodontics, College of Dentistry, Positivo University, Paraná, Brazil; ⁴Professor, Department of Implantology and Pathology, College of Dentistry, Positivo University, Paraná, Brazil; ⁵Professor, Department of Implantology and Biotechnology, College of Dentistry, Positivo University, Paraná, Brazil.

Correspondence:
Dr. Grossi JR. Department of Implantology and Periodontics, College of Dentistry, Positivo University, 294 Tibagi St Curitiba, Paraná, Brazil. Zip code 80060-110. Phone/Fax: 41-32224442. Email: j.grossi@hotmail.com

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Abstract:
Background: Human immunodeficiency virus (HIV) is a retrovirus, identified in 1982, oral manifestations include post-surgical complications and special care to a safe surgical intervention should be followed, making it the most favorable prognosis.

Methods: This review is to evaluate the cases published in world scientific literature involving HIV+ patients undergoing therapy with dental implants and their reactions, compared to patients without this disease. Moreover, reports the planning, implementation and follow-up of 36 months of a case with immediate load fixed full arch prosthesis in complete edentulous lower jaw with three implants on HIV+ patient.

Results: A 56 years old, toothless in both jaws. All serologic and clinic examinations were favorable, as well as the X-ray examinations, without pathological changes or bone problems. Treatment plans was a complete denture maxillary and immediate load with implants mandibulary. Three implants 3.75 diameter × 15 mm length, one in a median region, and two tilted to distal, bilaterally to reduce the cant-lever were performed, abutments installed and provided the final prosthesis after molding to delivery on the next day.

Conclusion: The patient reports complete comfort with prosthesis, the knowledge of hygiene techniques available to the longevity of the case, and the improvement in their overall health with implants, because feeds more and better, with a suitable grinding food providing a better health for treatment against HIV. The dental implants show great option for the rehabilitation of these patients as demonstrated in this review, and reporting and monitoring of 36 months immediate loading.

Key Words: Dental implants, human immunodeficiency virus infection, immediate load, systemic disease, prosthetic rehabilitation

Introduction

In 1981, the first reports were linked to new disease that materialized.¹ Human immunodeficiency virus (HIV) is a retrovirus, identified in 1982,² considering the incubation period of HIV, the virus introduction in the world must have occurred in the 1970s because on average the infected person takes between 8 and 10 years to start developing the first symptoms of AIDS disease. Its dissemination, in a first moment, occurred in the main areas of large cities, if sprawling for other regions in the early 1980s.³

According to data from the World Health Organization, nowadays, there are many Governments not only prevent but also offering free and universal access to antiretroviral treatment since 1996 are distributed more than 17 different types of free medicines to control the disease,⁴ and promote an improvement in quality of life of people affected by this disease related to contagion prevention policies.

Searches by vaccines, seeking fast, and immediate activation of the immune system have been carried out.⁵ Current data estimated worldwide show that 36.7 million people globally were living with HIV,⁶ being the vast majority in sub-Saharan African region and some in South America, North America, and Europe and less in Asia.⁷ The stages of the disease can vary from:⁸

1. Asymptomatic, which can last for months or even years.
2. Secondary stage proliferative stage, where the immune system begins to be damaged, resulting in increases of lymph nodes, night sweats and intestinal failures.
3. Stage of acquired syndrome, with severe impairments in immune system, and neoplasms type lymphomas and sarcomas.

Oral manifestations include post-surgical complications,⁹ and special care to a safe surgical intervention should be followed,¹⁰ making it the most favorable prognosis. With the development of treatments through the suppression of the viral load by
cocktails of highly active antiretroviral therapy (HAART) the quality of life of people with HIV infection has improved, and life expectancy has increased, allowing these patients to live decades after infection, and a HAART therapy increase the CD4+ defense cells over 200/mm³ also helping in significant improves over the negatives effects that HIV infection may cause in post-surgical implants protocols.

With this improved control of viral load being below 10,000/ml, and knowing and following the existing protocols for the treatment of patients with this type of infection, dental implants can and should be a treatment option to replace the conventional prostheses, with improve in chewing and grinding food and generating appropriate blood and nutrients to support treatment with cocktails of medicines, strengthening the body and thus preventing opportunistic infections in mouth or general, increasing life expectancy of patients, and consequently, the demand for dental procedures with this objective.

The dental team requires special support and preparation for these types of patients seeking care, since not all report be carriers of this disease, and not all dental professionals demonstrate the interest of handle or repair existing mouth problems of this group of people, arriving to the numbers of 44% in Brazil, and 50% in the United States of America (USA), the willingness of the dental team to help HIV+ patients.

In the scientific literature, there are few works reporting the rehabilitation of absence in the jaws with the technique of dental implants in immediate load and prostheses supported by them. These seem to demonstrate that in invasive dental surgeries, increased risk does not occur for these patients since its systemic conditions are well controlled.

The aim of this article is to review the scientific literature about this topic, seeking to establish parameters, pre- and postsurgical cares and the technique used in placement of dental implants, as well as the prognosis of this treatment in patients HIV+ reporting the case performed in immediate load with a detailed clinical, radiological, and tomography monitoring of 36 months.

**Materials and Methods**

In a survey conducted in PUBMED scientific databases, using keywords such as dental implants and HIV, have been found few and occasional reports of published cases, two literature review associated with a case reports and prospective studies, and just one immediate loading case. There are few long-term studies about the HIV virus and its interrelation with the longevity of dental implants as shown in Table 1.

In 1998 Rajnay was the first documenting and reporting the success of the installation of a single tapered dental implant in HIV+ patient, screwed immediately in a fresh socket, mandibular central incisor, using a narrow implant of 3.25 diameter millimeters and 15 mm length (Micromini 3i, USA) and an immediate tissue guided regeneration in this extraction area, with CD4+ T-lymphocyte count of 600-35,000 cells/mm³, viral load of 150-200 copies/ml. After 6 months of healing was performed the reopening or second stage of the implant and weeks after the final crown were cemented, being examined with X-rays and an follow-up after 18 months with clinical examination, noting excellent peri-implantar healthy and esthetic and full masticatory rehabilitation, besides patient satisfaction.

In 2004, Baron et al. described the full rehabilitation of a 27-year-old female patient HIV+, who also had infection of both hepatitis B and C viruses and with CD4+ T-lymphocyte count of 200-400 cells/mm³, viral load of <50 copies/ml. The oral rehabilitation consisted of posterior bilaterally in both jaws, from the canines, where they performed 12 implant (Nobel Biocare, Sweden) 3.75 mm diameter and length of 3.25 diameter millimeters and 15 mm length (Micromini 3i, USA) and an immediate tissue guided regeneration in this extraction area, with CD4+ T-lymphocyte count of 600-35,000 cells/mm³, viral load of 150-200 copies/ml. After 6 months of healing was performed the reopening or second stage of the implant and weeks after the final crown were cemented, being examined with X-rays and an follow-up after 18 months with clinical examination, noting excellent peri-implantar healthy and esthetic and full masticatory rehabilitation, besides patient satisfaction.

<table>
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<tr>
<th>Authors</th>
<th>No. of patients</th>
<th>No. of implants</th>
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<th>Range of viral load (copies/µl)</th>
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only 7 months after the first surgery. A fixed prosthesis were made with cant-lever in the region of teeth #3, #14, #19 and follow-ups for reviews and clinical and radiographic examination were performed with 6, 12 and 24 months not being noticed any abnormality on the evolution of therapy with dental implants and complete masticatory rehabilitation, with healthy appearance and patient satisfaction.

In 2005, Shetty et al. showed satisfactory results obtained with the installation of 8 implants (Zimmer, USA) on both jaws in posterior regions bilaterally in a 47-year-old male patient HIV+ with CD4+ T-lymphocyte count of 170 to 419 cells/mm³, viral load of <50 copies/ml. All implants were installed with insertion torque of 40 Ncm. The second stage surgery was performed 6 months after implants installation and single and partial bridge with porcelain fused to metal crowns was installed and follow ups with 6, 12, 24 and 36 months were made and have been found periimplantar healthy, despite the constant use of periodontal and perimplant esthetics systems, since the existence of remaining teeth healthy.

In 2005, Strietzel et al. evaluated the data obtained with the success of dental implants performed in 3 different patients using HAART and with CD4+ T-lymphocyte count of 480 to 800 cells/mm³, viral load of <50 copies/ml. Case 1 a 64-year-old male patient, lower jaw toothless performing 4 implants (Friailit 2, Dentsply, Germany) in the interforaminal region, and 4 months after this surgery the prosthetics abutments and magnetic retainers were installed to provide retention and stability for the overdenture. The case 2 refers to a 38-year-old male patient performing two single implants Friailit 2 (Dentsply, Germany) in teeth #19 and #30, healing uneventful, being performed the second stage in 4 and 6 months after installation of the implants, with cemented crowns. The case 3 was a 49 years old female patient lower jaw toothless, performing 4 implants Friailit 2 (Dentsply, Germany) in the interforaminal region, and 4 months after this surgery the prosthetics abutments and magnetic retainers were installed to provide retention and stability for the overdenture.

In 2006, Achong et al. have been published the positive results achieved within 24 months of follow-up in their dental implants cases, 3.75 mm diameter ranging between 10 and 13 mm in length (Zimmer, USA), in 3 different HIV+ patients, all using HAART medications, with CD4+ T-lymphocyte count of 180 to 657 cells/mm³, viral load of 4500 to 9200 copies/ml. The case 1 was a 56-year-old male patient performing 2 dental implants, and single crowns. The case 2 was a 45-year-old male patient with a history of hepatitis B virus infection, performing 2 dental implants and single crowns. The case 3 was a 46-year-old male patient, lower jaw toothless, with a history of hepatitis B virus infection, performing 2 dental implants to support an overdenture. All cases were reopened 6 months after the first surgery. Periodic clinical follow ups were conducted with 6, 12, 24 months after final prosthesis, where there were no changes and normal aspect of periimplantar tissues, showed through radiographic examination a bone healthy and bone quality besides patients satisfaction.

A prospective study conducted in 2007 by Stevenson compared the success rates achieved over a short period of time in patients toothless HIV+ patients versus HIV-negative patients, requiring dental implants to retain the prostheses in lower jaws. Were selected through criteria of inclusion/exclusion 29 patients, including 20 HIV+ patients and 9 HIV-negative patients, being 4 females and 16 males patients in the study group (HIV+), with ages ranging between 35-59 years, average 48.9 years. The control group (HIV negative) was composed of 6 females and 3 males patients, with ages ranging from 50-82 years, average 65.3 years. Was observed in the study a 100% of success rate in the various acceptable clinical aspects for dental implants. All cases had a minimum of residual bone ridge according to accepted guidelines, and 2 dental implants (BioHorizons, USA) on each patient totalling 40 implants and o’ring abutments were installed, to retain the lower jaws over dentures. Follow ups and evaluations at the time of surgery and 6 months after were conducted to assess ridge bone density and bone levels around the dental implants. Data such as smoking, endocrine situation, use of HAART therapy, viral load, and CD4+ cell count have been evaluated on specified dates with CD4+ T-lymphocyte count of 132 to 948 cells/mm³, viral load of 1534-113536 copies/ml. The results after 6 months of follow-up revealed that there were no statistically significant differences in the healing process and initial function among patients with or without HIV virus infection who received dental implants and prostheses retained by them.

In 2011, Kolhatkar et al. described a successful immediate implant placement in two male patients with 48 and 55 years old undergoing extraction of a mandibular second premolar. Both patients were HIV+, receiving HAART therapy medications, with CD4+ T-lymphocyte count of 344-379 cells/mm³ and viral load of 57-32,551 copies/ml. Case 1, atraumatic extraction were performed in tooth #29 and a 4.5 mm diameter by 11 mm length implant (Zimmer, USA) was placed and did not need additional bone grafting and the healing abutment was placed at the time of implant placement. Case 2 an extraction were performed in tooth #20, osteotomies prepared in the ideal orientation, and implant 4.0 mm diameter by 11.5 mm length (BioHorizons, USA) on each patient totalling 4 implants (Frialit 2, Dentsply, Germany) in the interforaminal region, healing uneventful, being performed the second stage in 4 and 6 months after installation of the implants, with cemented crowns. The bone-to-implant gap in this case 2 was > than 1.5 mm, which required a particulate bone graft, and a second-stage surgical procedure. Patients were seen at 2 and 4 weeks for postoperative assessment. No adverse post-operative sequelae were observed, all implants integrated, successfully restored whit cemented single crowns and the patients were very pleased on follow-up of 32 months.
In 2011, Oliveira et al. placed dental implants in the posterior mandibles of 40 volunteers, all dental implants was inserted in mandibular premolar and molar edentulous spaces (Serson, Brazil), with a 3.5 mm minimum diameter and length ranging from 10 to 16 mm divided into 3 groups: Group 1 composed of HIV+ patients using HAART therapy with protease inhibitor with CD4+ T-lymphocyte count of 132 to 690 cells/mm³, viral load of 2-52.7 copies/ml, Group 2 composed of HIV+ patients using HAART therapy without protease inhibitor with CD4+ T-lymphocyte count of 100 to 1000 cells/mm³, viral load of 1.9 to 168 copies/ml and a Group 3 composed of HIV-negative patients. The authors assessed peri-implant health 6 and 12 months after implant loading and followed 59 implants for 12 months after loading. Average peri-implant bone loss after 12 months was 0.49 mm in Group 1, 0.47 mm in Group 2, and 0.55 mm in the Group 3 or control Group, with complete satisfaction of all patients.

In 2014, Romanos et al. evaluated the immediate loading in a 43-year-old male patient, being the first immediate load case reported in HIV+ patients. They described this clinical case report that presents a surgical and prosthetic implant-supported immediate loading protocol in an upper and lower jaw toothless HIV+ patient with CD4+ T-lymphocyte count of 479 cells/mm³, viral load not specified. Eight 3.25 mm diameter implants were placed in each jaw, 12 implants of 14 mm and 4 of 11 mm in length (Ankylos, USA), and no ridge augmentation procedures were required. All the implants were connected with abutments, and a temporary fixed restoration was placed immediately after surgery. The final fixed reconstruction was cemented after 10 weeks of loading. All implants showed no clinical signs of mobility or infection. Periotest values were evaluated during healing and showed a progressive osseointegration. Radiological findings showed stable bone levels and complete satisfaction of the patient after a follow-up period of 48-month.

In 2015, Gherlone et al. conducted a prospective longitudinal study with HIV+ patients with a stable disease and good oral hygiene requiring implant rehabilitation. Each patient received at least one dental implant and 68 patients were treated, totalling 194 implants. 66 patients and 190 implants were followed for 12 months. No significant associations were found between, oral hygiene-associated variables, and any of the outcome measures. The CD4+ T-lymphocyte count was from 400 to 1100 cells/mm³. Failures occurred in 7.9% of the implants, being 2.6% of failures due to early infection and 5.2% due to perimplantitis. 48 patients treated with overdentures, 11 patients with partial prosthesis, and 9 patients with single elements and all cases showed satisfactory prognosis.

A retrospective case series of HIV+ patients treated with dental implants was studied in 2016 by Gay-Escoda et al. Several clinical parameters were registered, with CD4+ T-lymphocyte count of 259-1115 cells/mm³, viral load of <50 to 59 copies/ml. 9 participants received 57 implants in anterior and posterior regions in both jaws from 4 different brands (Astra, USA) (Defcon, Spain) (Nobel-Biocare, Sweden) (Straumann, Switzerland) and a wide range of prosthesis types such as single crown, fixed partial prosthesis, overdenture, hybrid metal-resin prosthesis, and fixed full-arch. The patient’s average age was 42 years, and there were 5 males and 4 females. In addition, the patients were assessed for implant survival and success rates and for the prevalence of perimplant diseases. The implant survival and success rates were 98.3% and 68.4%, respectively, with an average follow-up of 77.5 months (54 to 103 months). The patient-based prevalence of perimplant mucositis and perimplantitis were 22.2% and 44.4%, respectively, at the last appointment. Patients that attended regular periodontal maintenance visits had significantly less mean bone loss than non-compliant patients (1.3 mm and 3.9 mm respectively). All the rehabilitation with dental implants in HIV+ patients seems to provide satisfactory results.

**Case Report**

In 1990, a patient was diagnosed with HIV, being contaminated by her husband, and getting under medical care since then using a HAART therapy, provided for free by the Government of Brazil since 1996. During the years of disease, the patient not reported important admissions to hospital and presented at the Branemark Osseointegration Center in Bauru, São Paulo, Brazil, with 56 years old at that time, reporting be toothless in both jaws, upper and lower, did more than 16 years. All serologic and clinic examinations were favorable, also in the radiographic examinations showed the total absence of teeth in both jaws without pathological changes or bone problems (Figure 1). The treatment plan was exposed to the patient and also each treatment phase and possible complications and risks specific to invasive surgeries performed on patients HIV+.

Informed consent about the treatment was signed by the patient, and also the analysis of blood functions, viral load and platelet count, was ordered for a correct planning and treatment, being decided after checking all the general state, to
perform a surgery for dental implants immediate load in lower jaw and complete denture in upper jaw.

By virtue of the absence of prosthesis in both jaws for many years was chosen to perform the decision-making and implementation of facial references for complete dentures for both jaws to activate the muscles allowing the use of a multifunctional guide at the moment of surgery and prosthesis. This new complete denture was used for a minimum period of 40-day, looking to balance of the masticatory system and the return of normal occlusion reflexes, chewing and swallowing that went smoothly, facilitating the procedures the occlusion and the use of a multifunctional guide at trans-surgical process.

After conference vital signs and blood pressure by the team doctors, a pre-surgical 4 mg dexamethasone 3000 mg amoxicillin and 15 mg midazolan was given. Following our previous treatment plan with just a few dental implants to connect the metallic bar we began installing 3 implants (P.I. Philosophy, Brazil) 3.75 diameter x 15 mm length, smooth surface (Figure 2), external hexagon, one in a median region, and two tilted to distal in the region before the mental foramen, bilaterally to reduce the cant-lever in the future prosthesis. All implants have an insertion torque exceeding 50 N, allowing a safe immediate load in these situations (Figure 3).

Three abutments whit 3 mm height were installed in all implants with 20 N final torque to support a metallic bar with aesthetic acrylic coating and artificial teeth as the final prosthesis. A multifunctional guide was used, which transferred the correct positioning of the implants at the time of surgery, the correct positioning of abutments, and also the correct occlusion vertical dimension, became easier the whole process of final prosthesis construction (Figure 4).

After molding this multifunctional guide follows for mounting in semi-adjustable articulator, enabling the casting wax, and try-in of metallic bar with teeth in wax. After 24 h the patient returned for checking the accuracy of work in many aspects, such as passive adaptation of the metallic bar, the correct occlusion between jaws and a harmonic and aesthetic beauty being noticed mild bleeding and no local swelling, and pain free and also a panoramic radiographic showed the passive adaptation of the final prosthesis. After acrylization and polishing, with 48 h after surgery (Figure 5), we delivered the final prosthesis with a final torque of 10N and did final occlusion verification and final adjustments leaving the patient to chew softly (Figure 6).

Successive follow ups every 60 days were did during the first 4 months after the surgery to check the healing process, check the abutments torque and do some occlusal adjustments and after this period every each 6-month it was done the same protocol. Periapical and panoramic radiographs was made with 12 months of follow-up (Figure 7), with 24 months of follow-up (Figure 8) showing the complete absence of signs and symptoms related to bone peri-implantitis or problems with the integration of implants (Figure 9) and a computerized tomography (Figure 10) was made in 36 months of evaluation showing perfect osseointegration and excellent marginal bone levels.
The patient reports complete comfort with both prosthesis, the knowledge of hygiene techniques available to the longevity of the case, and the improvement in overall health throughout the years after therapy with implants because feeds more and better, with a suitable grinding food providing a better health for treatment against HIV infection.

Discussion

Some clinicians do not recommend the placement of dental implants in patients HIV+ because they fear the increased risk of complications or post-surgery infections when they are undergoing invasive dental procedures being demonstrated by literature the post-surgery response seems normal when compared to HIV-negative patients. As generally occur an immune system disorders can be confused with decreased power of healing and infection, there is a controversy involving healing and other complications after teeth extractions in patients HIV+ and in clinical relevance studies assessed that teeth extracted from HIV+ patients not proved to have an increased risk of complications when compared to healthy patients. A recent systematic review of literature concludes that the evidence are insufficient to determine which patients HIV+ can develop a high risk of complications after invasive dental procedures. However, the number of patients in these studies is limited the findings show that the procedure of dental implants installation is well tolerated in HIV+ patients.

When well indicated and performed, the dental implants therapy can improve the masticatory function and phonetics regardless of the type of HIV infection. This therapy may help beyond appearance and function, improving nutrition, increasing the quality of life of patients with HIV.
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As the number of patients HIV+ that can be benefited with the therapy of dental implants continues to increase, dentistry professionals need to know and evaluate all the possibilities of treatments that can be offered to this complex group of patients before denying attendance.17

Clinicians need this scientific evidence,13,14,16,18,21,32 which justifying and collaborate in the indication of the dental implants in patients HIV+, and in addition should understand that dental invasive procedures are proposed for these patients, the clinicians should be informed of the oral manifestations and complications of this disease, adding treatment alternatives that can increase your success rate in therapy with dental implants.7,8,10

Based on the short-term results both patients, with or without HIV infection, have shown clinical and radiographic high success rates after therapy with dental implants with a wide range of prosthesis removable or fixed regardless of the type of HIV infection.12,13,15,19,20,22,24,25,27

The high success rates can be explained in part by the region where the dental implants were inserted and the lower jaw region it is a more favorable area because the bone density and anatomical structure are ideal for perforations,30 and all post-surgical follow ups in the first or second stage of treatment with dental implants works well and the dental implants remaining in full function.18,21,24,26,28,32

With the relevant increase of scientific work in this area, the dental implants has shown another great option for the rehabilitation of the HIV+ patients as demonstrated in this 36 months case report of immediate load and this literature review about this topic, and should be a treatment option to be indicated for replace the dental loss either partial or total. Care in the planning and implementation of rehabilitation should be made as in patients without HIV infection, becoming this advance planning vital for the satisfactory outcome of any case with dental implants. Within the limitation of the present case, placement of dental implants in HIV+ patients with stable disease seems a reasonable treatment option, regardless of CD4+ cell count, provided that they are in a normal range.

References

Figure 10: (a and b) 36 months of follow-up, computerized tomography views.
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