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# Full Mouth Reconstruction in a Diabetes Mellitus Type I Patient – A Case Report with 5 Years Follow-Up

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## Abstract

Periodontal disease is one of the most common oral diseases, caused by a combination of poor oral hygiene and host defense response. It can be influenced by genetic, environmental and/or developed conditions such as smoking and diabetes mellitus. Periodontitis leads to bone resorption and has a reported relationship with peri-implantitis development and implant failure. However, when sugar levels are controlled, even diabetic patients can have a long-term success and survival of dental implants. In addition, the patient's ability to maintain a good oral hygiene has been reported as a critical factor to achieve that goal. Dental implants are a good option for these patients, although there are some factors that should be ensured prior to the treatment, such as improvement and maintenance of oral hygiene levels, compliance in disease-control and quitting or reducing of smoking. The purpose of this case report with 5 years follow-up is to review the importance of motivation, education and maintenance in a patient who received dental implants as a type I diabetic with a history of chronic heavy smoking and poor oral hygiene.

## Introduction

Periodontal disease is a chronic inflammatory disease that affects the periodontium. It is one of the most common oral diseases, caused by a combination of poor oral hygiene and host defense response, and can be influenced by genetic, environmental and/or developed conditions such as smoking and diabetes mellitus. Periodontitis leads to bone resorption, which, without proper maintenance, can ultimately lead to a hopeless prognosis [1,2].

In cases of partial or complete edentulism, osseointegrated implants as a support for dental prostheses are a viable treatment option to replace the missing teeth which nowadays is becoming more accepted due to its high success rate. However, mechanical and biological risk factors can cause implant failure. Mechanical factors pertain to implant characteristics such as body design and surface architecture, while biological factors involve host aspects like chronic heavy smoking (more than 10 cigarettes a day), diabetes mellitus, or presence of periodontal disease. In literature, these biological factors are considered as relative contraindications for dental implants [3-5].

Smoking can affect wound healing due to the decrease in blood supply in periodontal tissues and therefore influences the bone quality. However, it is reported in the literature that reducing the number of cigarettes can decrease the complications with dental implants [6].

Diabetes mellitus type I is characterized by high glucose levels in the blood due to lack of insulin production, which hinders host resistance. This consequently delays wound healing and increases the risk of infection specially in the soft tissue. However, literature reports that diabetic patients with controlled sugar levels can have a long-term success and survival of dental implants [7]. Likewise, the patient's ability to maintain a good oral hygiene has been reported as a critical factor in achieving that goal.

Early loss of teeth due to periodontal disease can be associated both with diabetes mellitus type I and chronic heavy smoking habits. Young patients that started to lose their teeth due this condition are worried about esthetics, and they are not compliant in using removable dentures as they prefer fixed prostheses. Dental implants are a good option for these patients, although there are some factors that need to be considered prior to the treatment, such as improvement and maintenance of oral hygiene levels, compliance in disease-control and quit/reduce smoking.

The purpose of this case report with 5 years follow-up is to review the importance of motivation, education and maintenance in a patient who received dental implants as a type I diabetic, with a history of chronic heavy smoking and poor oral hygiene.

**Table 1:** Patient demographics.

| Age | 31 years old |
|---|---|
| Sex | Female |
| Medical History | Diabetes type 1 |
| Dental History | Generalized Periodontal Disease |
| Social History | Smoker (15-20 cigaretes per day) |

## Materials and Methods

A 31 year old Caucasian female patient presented in the private clinic in 2011 with the chief complaint "I want to replace my teeth with some fixed restoration, not removable". The medical, social and dental history of the patient were reviewed: she had diabetes type I (HbA1c was 6.7%) and was taking insulin as medication to control the disease. Furthermore, she was a chronic heavy smoker (15-20 cigarettes per day) and reported that she already had some teeth extracted due to generalized periodontal disease (Table 1). At that time, she was using a removable partial denture, but she was not comfortable with it. After comprehensive examination, the proposed treatment plan included extraction of all the remaining teeth and replacement with dental implants and a fixed hybrid prosthesis

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**Figure 1:** Preoperative intraoral frontal view.

**Figure 2:** Preoperative panoramic radiograph.

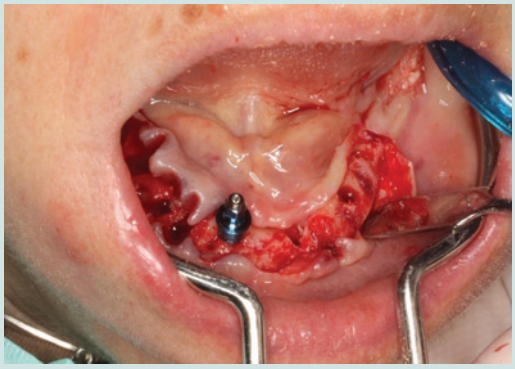

**Figure 3:** First surgery - Intraoral view of immediate implant placement in the mandibular arch.

in both arches. The patient understood the pros and cons of the treatment, agreed, and signed the consent form to proceed with the presented treatment plan.

Before starting with the surgical treatment, the patient was advised that the diabetes mellitus should be well controlled, so when she came for surgery her HbA1c levels were 6.1%. In November of 2012, the first surgery was performed, consisting of extraction of the remaining maxillary teeth followed by the delivery of an immediate removable complete denture. For the mandible, the treatment included extractions, immediate implant placement and immediate provisionalization. One hour before the surgical procedure, the patient took 2g of amoxicillin with clavulanic acid as prophylaxis. The procedure was carried out under local anesthesia (4% articaine with 1:100000 epinephrine, Inibsa, Portugal). After anesthesia was achieved, the teeth were atraumatically extracted using periotomes, elevators and forceps. In the mandible, a midcrestal incision from right first molar to left first molar areas was made and a full-thickness flap was reflected. Five implant sites were prepared following the protocol established by the manufacturer, and immediate implants were placed in the osteotomies (3 SIN 4.0 x 10 mm and 2 Biomet 3i Osseotite 3.25/4 x 10 mm). After that, temporary cylinders were placed in four of the five implants and a metal-reinforce acrylictemporary was delivered and immediately loaded. Primary closure of the flap was achieved with 4/0 silk sutures (Inibsa, Portugal). A maxillary immediate removable complete denture was delivered, and a mandibular immediate complete denture was screwed in. The patient was prescribed antibiotic (amoxicillin 875mg with 125mg clavulanic

**Figure 4:** First surgery - Postoperative intraoral frontal view after suture.

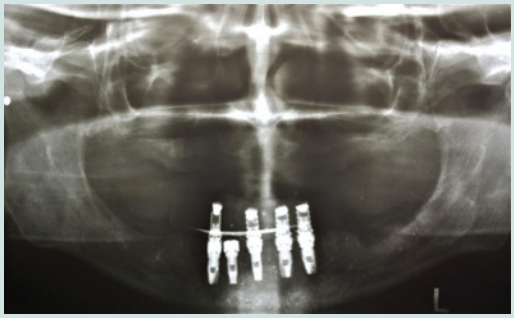

**Figure 5:** First surgery - Postoperative panoramic radiograph.

**Figure 6:** First surgery – Postoperative intraoral frontal view.

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**Figure 7:** Preoperative intraoral frontal view.

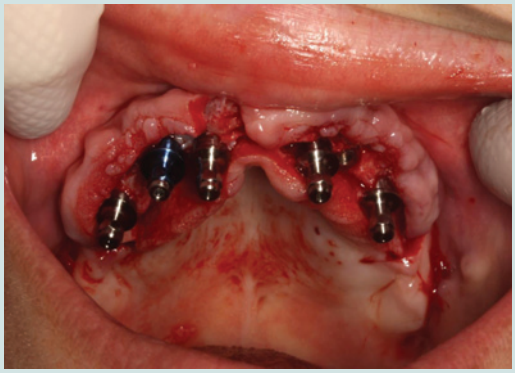

**Figure 8:** Second surgery - Intraoral view of implants placement in the maxillary arch.

**Figure 9:** Second surgery - Postoperative panoramic radiograph.

acid every 12h for one week), analgesic (ibuprofen 600mg every 8h as needed) and mouth rinse (0,12% chlorhexidine for 10 days). After 1 week, she came back for a follow-up and the sutures were removed. The healing process was uneventful, with no infection, inflammation or pain.

In March of 2013, a second surgery was performed in order to place six implants in the maxilla. The same pre-operative and surgical protocol was followed, and in this case a vertical incision was made in the midline to facilitate the reflection of the full-thickness flap. Six implants were placed (2 SIN 4.0 x 10 mm implants and 4 EBi 4 x 4.1 x 8.5 mm implants) and submerged with cover screws. Primary closure of the flap was achieved with 4/0 silk sutures (Inibsa, Portugal). The patient continued to use the maxillary removable complete denture after relining it. The same post-operative protocol and instructions were given to her, and in the follow-up visit the healing was again favorable (Figures 1-9).

By the end of 2013, both maxillary and mandibular final restorations (fixed hybrids) were delivered (Figures 10-13).

During the following 5 years, the patient came back to the dental office for maintenance visits every 6 months, where oral hygiene instructions, education about diabetes mellitus control with medication (patient HbA1c values were always under 8%) and motivation to quit/reduce smoking were reinforced (Figures 14-19).

## Discussion

According to literature, patients with history of periodontal disease are more susceptible to periimplantitis [9]. In the systematic

**Figure 10:** Intraoral frontal view of final restoration on day of delivery.

**Figure 11:** Intraoral left lateral view of final restoration on day of delivery.

**Figure 12:** Intraoral right lateral view of final restoration on day of delivery.

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**Figure 13:** Extraoral frontal smile view on the day of final restoration delivery.

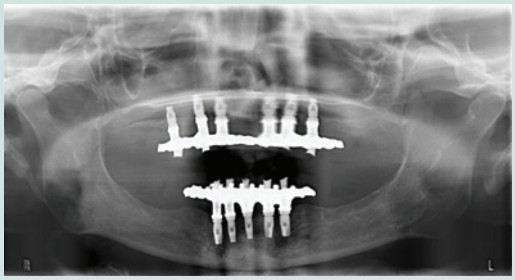

**Figure 14:** Panoramic radiograph 4 years after final restoration delivery.

**Figure 15:** Intraoral frontal view 4 years after final restoration delivery.

review of Ferreira et al. (2018), it was concluded that the history of periodontitis is associated with the occurrence of periimplantitis. Similarly, in the meta-analysis of Sgolastra et al. (2015) it was determined that periodontal disease is a risk factor for implant loss and periimplantitis, and that it is also related to higher levels of implant bone loss [10,11].

Smoking tobacco is also associated with teeth loss because it causes soft tissue inflammation, decreases salivary flow, suppresses immune response and persuades vasoconstriction, thus facilitating bacterial growth and deterring regeneration of the periodontium [12,13]. According to the literature, even the exposure to tobacco smoke is associated with periodontal disease when compared with non-exposition to it [14]. Moreover, smoking has an imperative effect in the incidence and development of periodontal disease, since smokers have 80% more risk of periodontal disease than smokers who quit and nonsmokers. However, smoking cessation has a positive effect in decreasing the risk of periodontal disease (around 14%) and improves the response to nonsurgical periodontal therapy in the first year after quitting. Likewise, the risk of developing a periodontal disease in quitters seems to be similar to the one for nonsmokers [13,15]. In the systematic review of Dreyer et al. (2018), it was reported that smoking tobacco is also a risk factor for developing peri-implantitis [9]. However, this habit should not be considered as an absolute contraindication for implant placement: even if there is

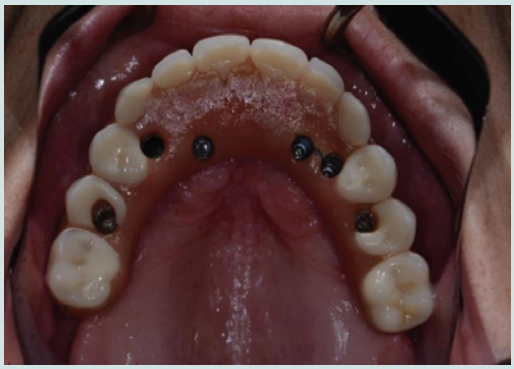

**Figure 16:** Intraoral maxillary occlusal view 5 years after final restoration delivery.

**Figure 17:** Intraoral mandibular occlusal view 5 years after final restoration delivery.

**Figure 18:** Intraoral frontal view 5 years after final restoration delivery.

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**Figure 19:** Extraoral smile view 5 years after final restoration delivery.

a higher risk of failure during the initial healing time after surgery, some authors like Chrcanovic et al. (2015) reported that this depends on the implant surface's roughness [16-19]. The patient in the current case report reduced the number of cigarettes smoked per day before performing the treatment, which could be considered as the first key factors for the long-term success of it [20] (Figures 14-19).

In the systematic review of Mauri-Obradors et al. (2017), it was concluded that there is a correlation between diabetes mellitus and periodontal disease [21]. The increase of glucose in the blood is associated with higher risk of periodontitis due to alterations in host-immune response against the biofilm such as the decrease of neutrophil adherence, chemotaxis and phagocytosis, all facilitating bacteria to persist in the oral cavity [22]. Similarly, periodontal disease may cause alterations in the glycemic control (measured using HbA1c) in diabetic patients as reported in the systematic reviews of Simpson et al. (2015) and Hasuike et al. (2017), where they found that diabetic patients with periodontitis who undergo periodontal treatment improved their glycemic control [23,24]. In the systematic review of Guobis (2016) it was also stated that diabetes mellitus is an impending factor for postoperative healing progression after implant placement. As a consequence, this treatment option in diabetic patients should be only performed in selected cases in which the patient is compliant in controlling the disease as well as in coming to the dental office for follow-up appointments [25,26]. According to the literature, the overall implant failure rate is not higher in diabetic patients when compared with non-diabetic patients. However, those have a higher risk of implant failure especially during osseointegration and in the first year after loading [27,28], and they also experience more implant marginal bone loss in the long term [27]. In the systematic review of Naujokat et al. (2016) it was concluded that the implant survival rate after 6 years is similar for diabetic and non-diabetic patients. However, after 20 years there is a decrease in the implant survival rate in diabetic patients well controlled diabetic patients show better results both in implant survival rate and osseointegration than non-controlled ones. Likewise, in the systematic review of Schimmel et al. (2018) it was found that levels of HbA1c greater than 8% are related to less implant survival rate when compared to lower levels [29,30]. Despite all of the above, in the case report of Balshi et al. (2007), it was demonstrated that although implants in diabetic patient have a difference in bone remodeling according to RFA and stability measurements, immediate loading protocol is successful and osseointegration survival rate is high [31]. In the systematic review of Naujokat (2016) it was concluded that there is low risk of developing peri-implantitis in the first years, however peri-implant inflammation increases in long-term follow-up in diabetic patients. In the systematic review of Monje et al. (2017) it was concluded that the risk is higher in patients with hyperglycemia compared to patient with normal glucose levels in the blood and that smoking is not needed to enhance hyperglycemia influence in the peri-implantitis [29,32]. The current patient's HbA1c was being well controlled (always under 8%) by medication and this could be considered as the second key factor for the long-term success of the dental implant in addition to the patient's smoking reduction (Figure 14-19).

One of the critical factors to stop the progression of the periodontal disease is the plaque control performed by the patients. The systematic review of Newton et al. (2015) concluded that the dentist's intervention explaining to the patient the severity of the condition and the benefits of changing the oral hygiene care improves the general oral health [33]. After implant placement, the patient should be encouraged to improve home oral care and to be present in the recall visits every 3-6 months for professional oral care and follow-up evaluation. If this is the case, the long-term prognosis of the implants will improve [8]. In the study of Costa et al. (2012), it was concluded that patients without preventive maintenance after implant placement are more prone to peri-implant disease [34]. The current patient was instructed and motivated to start and maintain good oral homecare and to attend maintenance visits every 6 months, which could be considered as the last key factor for the long-term success of the dental implant treatment (Figures 14-19).

## Conclusion

- Diabetes mellitus, heavy smoking and poor oral hygiene are factors that can lead to periodontal and peri-implant diseases, and consequently to teeth loss and/or implant failure.
- Clinicians should address those factors before considering implant placement by educating the patient on diabetes mellitus control, quitting/reducing tobacco and oral hygiene instructions.
- Implant placement with/without immediate loading is a valid solution for well-controlled diabetic patients in need for fixed restorations.
- With proper maintenance, the implants placed on diabetic patients can have high success rate with minimal bone loss over a 5-year period of time.

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